Current Science

Vol. XVIII] NOVEMBER 1949 [No. 11


| | Page | | Page |
|---|---|---|---|
| *"Create More Wealth"* .. .. | 393 | *Oscillations of the Earth's Atmosphere* K. R. RAMANATHAN .. .. | 398 |
| *Indian Scholars in Australia* .. .. | 394 | *Obituary—Sir Ardeshir Dalal* .. .. | 399 |
| *Nobel Awards for Physics, Chemistry and Medicine, 1949* .. .. .. | 395 | *Fiat Reviews of German Science* .. | 399 |
| *Indian Science Congress, Poona* .. | 395 | *Letters to the Editor* .. .. | 400 |
| *The Institute of Palæobotany, India* .. | 396 | *Reviews* .. .. .. .. | 419 |
| *Rural Adult Education* .. .. | 397 | *Science Notes and News* .. .. | 421 |


## "CREATE MORE WEALTH"

IN the course of his stirring message to the Nation, Sardar Vallabhai Patel, Deputy Prime Minister of India, has called upon his countrymen to "produce more, spend less and waste nothing". Freedom from political bondage has been won; the economic freedom which is the basis of national prosperity and political stability has still got to be achieved, if we are to consolidate ourselves as a free and independent nation. In the attainment of economic independence, the resources of science and technology have to be mobilised and harnessed. Addressing the convocation of the Benares University on the 20th of this month Mr. K. M. Munshi, our scholar-statesman, declared, "In India population is increasing; food supplies are tragically short and our command over technology remains rudimentary. Science, therefore, for us is not a matter for luxury; it is a matter of life and death." On the same day at Delhi, Pandit Nehru addressing the citizens of the Metropolis, appealed to his audience to make the country self-sufficient with regard to food. Importation of food, he said, is a waste of national wealth.

The gravity of the economic crisis that faces us and the immensity of the task that lies ahead has been repeatedly emphasised by our leaders and industrialists. The time has come for clear cut policies and for strong and determined action. Speaking about food production Sardarji appealed for the co-operation of every citizen. "We have in hand so many schemes of irrigation. We have a huge area of cultivable waste which is waiting for the hands that can plough. Even the areas under cultivation can, with diligence and well directed efforts, be made to yield more. We have a big reclamation programme which is being financed from the money that we borrowed from abroad. In addition, we have programmes for subsidising schemes of food production. If we can concentrate on all these, I have no doubt that, in spite of the economic situation of to-day, we can produce enough to feed ourselves and reduce the heavy drain of freight and profits which we obligingly

remit to foreign growers and shippers. Just think of it. If we had at our disposal the amount which we have spent on food imports during the last three years, we would have completely rehabilitated those unfortunate brothers and sisters of ours who have had to leave their hearths and homes in Pakistan and who are still looking up to us for relief and succour. It bleeds my heart to see so many unfortunate countrymen living in conditions of filth and poverty. Let those, who pass by them, reflect for a moment how they themselves are contributing to their misery by failing in their duty to help themselves and help us in ensuring self-sufficiency in food."

Appealing to industrialists and labour, Sardar Patel said, "Government, industry and labour must all play the game in a spirit of national service. We must all have the fullest sense of national emergency; we must close our ranks as we do in the presence of a common danger; we must tighten our belts to give the nation the tribute we owe to it; we must all contribute our might to the creation of that huge reservoir of funds, both here and abroad, which we need to back our national effort for a happier and better state of living. Who flourishes if the country sinks into economic slavery? Who sinks if the country prospers? Let that be our ruling sentiment, let that be our ruling thought. Let industrialists concentrate on getting the maximum out of their plants and machinery; let labour lend its helping hand to the industrialists to exploit their resources to the maximum national advantage. It will be government's duty, which they must discharge, to ensure that the decks are cleared for action and there are no impediments, no bottle necks and no red-tape. The wheels must move with clock-like precision and perfect smoothness and there must be no mutual fault-finding. The tradesmen have also to do their part. It is their duty to ensure that the produced articles reach the consumer with the minimum of difficulty and at the minimum of extra cost. In such an inexorable and unrelenting struggle for existence, mercenary motives must not be allowed to rule to the exclusion of patriotic duty."

In this hour of grave emergency, the scientists and technologists should play their full part and extend their active support in implementing development programmes directed towards the liberation of our motherland from economic bondage.

## INDIAN SCHOLARS IN AUSTRALIA

ONE of the practical outcomes of the Australian Goodwill Mission which visited India last year, is the grant of Fellowships to Indian students to enable them to carry out post-graduate work in Australia (*Curr. Sci.*, 1948, 17, 232).

One senior and two junior fellowships for the year 1949-50 have been granted by the Australian Government to three Indian scientists. The Government of India are proposing to reciprocate this enlightened gesture by granting similar Fellowships to Australian workers in science, for study at research centres in India. The period of study in Australia extends from six months to two years; all expenses including those of travel from the home country are met by the Commonwealth.

Dr. K. V. Krishnamurthy, who holds the senior fellowship, is carrying out investigations on the native flora and breeding in commercial crops at the Botany School of the University of Sydney. Messrs. P. K. Shukla and Tejwani are the other two. The former is studying the cytogenetics of linseed in Waites' Agricultural Institute in Adelaide, while the latter is specialising in Agricultural Chemistry at the same centre of research.

The scholars are full of praise for the excellent arrangements which have been made by the Commonwealth Government to make their stay pleasant and fruitful. We learn that during the next year five instead of three are to be invited. The selection of candidates will be made by the Education Ministry of India; the final choice will however rest with the Commonwealth Selection Board, Australia.

## NOBEL AWARDS FOR PHYSICS, CHEMISTRY AND MEDICINE, 1949

THE Swedish Academy of Sciences has awarded the Nobel Prize for Physics to Prof. Hideki Yukawa, the distinguished atomic scientist, now on the staff of Columbia University, N.Y.

As early as 1935, Prof. Yukawa introduced a new field of force, responsible for short-range interaction of the neutron with the proton, but different from the so-called neutrino-electron field. Its most important consequence was that the field should be accompanied by new types of quanta, obeying Bose statistics and each having the elementary charge $+e$ or $-e$ and proper mass $m_u$ about 200 times that of the electron. The subsequent discovery of mesons in cosmic radiations with mass about 200 times the electron mass has confirmed that these mesons are identical with the quanta associated with the nuclear field. His other outstanding contributions include those on Dirac's generalised wave equations, slow neutrons, theory of $\beta$-disintegration, $\gamma$-ray encounter, scattering of mesons by nuclear particles, etc., etc. Dr. Yukawa is the first Japanese scientist to be awarded this exceptional and world renowned distinction.

The Nobel Prize for Chemistry of this year has been awarded to Dr. Williams Francis Giauque, Professor of Chemistry, Berkeley, University of California. For his invention and first application of adiabatic demagnetisation method of producing low temperatures below 1° absolute, he was awarded the Chandler Medal of the Columbia University in 1936; and for his discovery with Dr. H. L. Johnson of Oxygen Isotopes 17 and 18 by means of absorption of sunlight in the earth's atmosphere, he was awarded the Elliott Cresson Medal of the Franklin Institute in 1937. He has been a member of the American Philosophical Society since 1947.

His publications include many papers on the third law of thermodynamics; application of spectroscopy and quantum statistics to calculation of chemical equilibria; and low temperature calorimetric investigations of condensed gases.

The Nobel Prize for Physiology and Medicine has been jointly awarded to Dr. Walter Rudolf Hess, Swiss Physiologist, Director of Physiological Institute, Zurich University, and to Dr. Antonio Caetano de Abreu Freire Egas Moniz, skilled neurologist of Lisbon University.

A specialist in the circulatory and nervous systems, Prof. Hess has studied the reactions of animals to electric shocks, and has been able to determine how parts of the brain control organs of the body.

By applying electrodes to different parts of a cat's brain and by stimulating, he was able to reproduce specific normal responses to external stimulii in the animal.

Dr. Moniz, famous neurologist, was the first to work out the way to treat psychosis by prefrontal lobotomy, by which important nerve connections in the thalamus and prefrontal lobe can be severed so as to provide relief for schizophrenics and maniac depressives. Dr. Moniz is the first Portuguese to be awarded the Nobel Prize.

## INDIAN SCIENCE CONGRESS, POONA

THE 37th Session of the Indian Science Congress Association is due to be held at Poona from January 3 to 8, 1950 under the presidentship of Professor P. C. Mahalanobis, F.R.S.

The executive committee of the Association has planned a detailed programme to cover all branches of Science.

Distinguished scholars and administrators from many parts of India are expected to attend. A number of distinguished foreign scientists from the U.K., the U.S.A., France and the U.S.S.R. have also been invited. Information has been received that Professor Desmond Bernal of Birbeck College, University of London, Sir Robert Robinson, President of the Royal Society, accompanied by Lady Robinson, the Atomic Physicists Professor Joliot-Curie and Madame Joliot-Curie, Prof. Herman Mark, who is an authority on Polymer Chemistry, and Dr. E. U. Condon, Director of the National Bureau of Standards, Washington, will attend the session. It is also hoped that Prof. W. A. Engelhardt, Pavlov Institute of Physiology, Academy of Sciences, U.S.S.R., will come.

# THE INSTITUTE OF PALÆOBOTANY, INDIA*

AT this solemn hour, in the presence of this distinguished gathering, it is my special privilege to request the Prime Minister of India to lay the foundation-stone of the new buildings of the Institute of Palæobotany.

This is in some ways a unique occasion. For, this Institute is the first and only one of its kind in the world. And in asking you, Sir, to do us this great honour I feel I have something of a personal claim upon you.

Palæobotany is the common ground between Botany and Geology—it is in fact the botany of the rocks. As one who has had to do with the creation of this Institute and with the direction of its activities during the past few years I may be allowed briefly to explain that here we study not only fossil plants but also the rocks in which they are found. Experience has taught us that it is only thus that we can form anything like a full picture of plant life through geological time.

In the same way as a child's walk is made up of a series of falls, the edifice of Science is erected upon a series of mistakes.

The Science of Palæobotany began somewhat like a purely academic pursuit, a study of curios. Gradually the point of view has changed as it always does with time, and it has revealed new vistas. The whole outlook has now widened beyond recognition. To-day the study of fossil plants, pursued with modern techniques and with due regard to its repercussion, upon all the bordering sciences, already occupies a respectable place among the sciences and fully deserves the support that it is now receiving from all sources. It would not only allow us glimpses into the evolutionary history of plants, but helps us more and more accurately to tell the ages of strata and thereby to explore the mineral wealth of the earth, particularly coal and oil, to picture the geography of the past, and to understand the structure of the earth's crust with its recurring phases of earth movements some of them affecting entire continents.

With modern methods of study, geological formations many thousands of feet thick which geologists were accustomed to regard as barren of fossils and therefore not datable, have been shown to be teeming with microscopic fossils which have thrown a flood of light upon their geological age, and have given us improved methods of classifying the oil-bearing strata.

The stone, which it will be my privilege now to ask you to lay, is a somewhat unusual sort of monument. It has been purposely made up in this Laboratory from an assortment of rocks and fossils from many different countries, and from many geological forms from the oldest to the youngest, covering a span of time from at least 600 million years ago to only about the beginning of the Christian era. The specimens have either been collected by ourselves or have been presented to the Institute by numerous colleagues all over the world. Some of them illustrate discoveries of palæobotanical interest, others are of equally great geological significance or have importance in economic geology.

Some of these fossils were discovered only a few weeks ago in the Rajmahal Hills in Bihar. Slumbering for millions of years in the strata, these immortal things woke up, as it were, under the stroke of the geological hammer and again saw the light of day for the first time last January. Now they have been laid to rest again in this stone, as if in a second grave, but with their faces uncovered, undying witnesses of a strange world of the past.

Thus, within the limits of our resources and the technical exigencies, an attempt has been made in this foundation-stone to epitomize the entire field of palæobotanical science to-day, not only in India but in the world. We have been happy also to commemorate here in this way gifts received during the past 30 years or more from colleagues in far-off countries.

It is our hope that in this stone a link will have been forged in the chain of international goodwill and cultural co-operation. By laying this foundation-stone you will therefore be helping us to achieve for this young Institute a hopeful future of broad and truly international outlook which is one of our main objectives.

---

* Abstracts from the unaltered rough notes of the speech delivered by the late Professor Birbal Sahni, F.R.S., on the occasion of the laying of the foundation-stone of the Institute of Palæobotany, by the Hon'ble Pandit Jawaharlal Nehru, Prime Minister of India and Minister for Scientific Research, on 3rd April 1949.

## RURAL ADULT EDUCATION*

WHEN we contrast the demands which democracy makes upon the citizens of a State with the actual condition of education in the different countries of Asia, the picture is one of grave and anxious concern. It is true that in some exceptional cases the problem has been largely mastered. We have Japan which, according to figures available for 1946, has a literacy figure of 98%. Lebanon in the Middle East is also reputed to have a high literacy figure. Turkey has for 1945-46 literacy of 60% in towns and 40% in villages. Philippines with its figure of 52·6% is also comparatively well placed. The same remarks would apply to Ceylon, Thailand, Burma and China. We cannot, however, gauge the magnitude of the problem by percentages alone. China has a literacy figure of over 50%. If we take the total population of China to be 450 millions, this would give an adult population of about 225 millions. It is unlikely that the percentage of literacy will be the same for adults as for children and adolescents. Even if this questionable assumption is granted, the number of adult illiterates in China would be some 125 millions.

If we take the figures for India, we find that in pre-partition India, the total number of literates according to the 1941 census was 37 millions. Assuming that the number of adult literates is about 40% of the total number of literates, this gives a figure a little over 15 millions. This refers only to the pre-partition Indian provinces, but we may put the figures for adult literates after partition at roughly 11 millions. To this we have to add the number of adult literates in the States. This is estimated to be about 6 millions. The number of adult literates in India on the basis of 1941 census is therefore approximately 17 millions against a total adult population of about 180 millions, which gives a literacy percentage for adults slightly less than 10. This is not only unsatisfactory but positively disturbing. Naturally the Government of India propose to give first priority to a programme of Social Education in its schemes of educational development for the country.

We require in India about a million teachers for dealing with children of school-going age who constitute only about 12½% of the total population. For the adult illiterates who will amount to almost 50% of the population, we would, even on the same basis, require about 4 million teachers.

If we also make allowance for the higher ratio necessary in their case, the number of teachers required may amount to almost 5 millions. Against this, we can, of course, balance the factor that the adult education courses will perhaps last for about 3 months at a time for the first stage of literacy. Even then, the number of teachers to be continually employed on it will be over a million.

To find the million teachers for school children is difficult enough, but if we have to find another million for our programmes of adult education, the problem becomes almost insuperable. But we are considering in India the possibility of utilising the basic school teacher for our programme of Social Education. We are also examining a proposal to use some kind of social conscription by which all educated persons will be required to contribute this national service for a specified period. If all students after matriculation are compelled to teach for even six months, this would, of course, go some way towards helping the solution, but even then the gap to be overcome would be considerable.

There is also the question how far basic school teachers or young collegians will prove suitable for such a programme of National Education. Teaching small children requires in the teacher certain habits and attitudes which he may not be able to shed when addressing adults. Similarly, it is a problem whether young men and women just out of school will have the necessary patience and insight to be successful teachers of adults. It is to be hoped that the different aspects of this intricate question will be carefully gone into and recommendations made so as to be of use to us and other Asian countries.

* Abstract of the Inaugural Address by the Hon'ble Maulana Abul Kalam Azad at UNESCO Seminar on Rural Adult Education, Mysore, India, on the 2nd November 1949.

## OSCILLATIONS OF THE EARTH'S ATMOSPHERE*

THIS is a new book in the new series. "Cambridge Monographs in Physics". It deals in a concise but comprehensive way with the subject of tides in the atmosphere, an old subject which continues to yield a rich harvest of results of outstanding interest and importance.

The most conspicuous characteristic of the curve of daily variation of barometric pressure in the tropics is its semi-diurnal component with the maxima occurring at about 10 a.m. and 10 p.m. and minima at 4 p.m. and 4 a.m. It was conjectured by Laplace that this 12-hourly variation of the barometer was a tidal effect caused by the heating action of the sun and that the tides due to the gravitational action of the sun and moon were much smaller in amplitude. For a long time, however, it was not clear why the 12-hourly component and not the 24-hourly component was the more prominent. The suggestion was first made by Kelvin that the atmosphere had probably a free period of oscillation with period nearly equal to 12 hours and that the 24-hourly thermal tide-generating force of the sun amplified the 12-hourly free oscillation by resonance.

Further progress has been achieved mainly in this century. Working on Hann's collection of data of solar barometric variation all over the world, Schmidt, Simpson and others have deduced empirical formulæ to represent the variation of the semi-diurnal component over the earth's surface. Chapman and his co-workers have analysed most of the available mass of barometric data for lunar diurnal variation and different components of solar diurnal variation. Lamb showed that the oscillations of an atmosphere in adiabatic equilibrium could be discussed in terms of tidal motions of an ocean of equivalent depth. Taylor extended Lamb's result to an atmosphere with any given temperature distribution and analysing the propagation of air-waves from the Krakatau explosion of 1893 and from the great Sibrrian Meteor of 1908 showed that the observed velocity of propagation of these long air-waves was consistent with the known average distribution of temperature in the troposphere and lower stratosphere. Taylor found that the corresponding free period of oscillation of the atmosphere was only about 10 hours and could not explain the amplification of the 12-hourly component of pressure variation. He, however, pointed out that the atmosphere could have not only one free period but a whole series of free periods, depending on the temperature distribution in the atmosphere. The next advance was made by Pekeris who showed that if temperatures in the atmosphere had a maximum of about 350° A at about 60 km. as was required by other lines of evidence, and if this high temperature was succeeded in higher layers by a second region of low temperature, with temperatures of the order of 200° A at 80 km., the atmosphere would have another free period nearly equal to 12 hours. This had been guessed at before by aerologists' and has later been confirmed by the V2 rocket experiments in America.

Weekes and Wilkes extended Pekeris' calculations and using the differential analyser of the Mathematical Laboratory at Cambridge, computed the resonance curves of the atmosphere for various assumed temperature distributions. They have also discussed the energy-flow in the atmosphere on the proved analogy of the propagation of tidal waves with that of electro-magnetic waves in an atmosphere of varying refractive index.

All this and much more have been discussed in the first four chapters of the book. In the fifth and concluding chapter, there is a general discussion of the results and of points requiring further elucidation. Tidal motions in the *E* and *F* regions of the ionosphere discovered by Appleton and Weekes in England, and by Martyn and co-workers in Australia, their relationships with solar and lunar magnetic variations, the question whether there is still another region of low temperature above a hot *E* region are some of the points touched on. In the near future we may expect some of these problems to be cleared up.

This little book expounding lucidly and concisely the achievements of classical hydrodynamics in a subject of current interest will doubtless receive a hearty welcome from students of Mathematical Physics and of Geophysics in particular.

K. R. RAMANATHAN.

---

* *Oscillations of the Earth's Atmosphere.* By M. V. Wilkes. *Cambridge Monographs in Physics.* (Cambridge University Press, Bentley House, London, N. W. I.), 1949. Pp. xii + 76. Price 12/6 net.

## SIR ARDESHIR DALAL

THE sad and unexpected demise of Sir Ardeshir Dalal on the 8th of last month removes from the Indian scene of science and industry an enlightened, patriotic and farsighted industrialist and a distinguished administrator.

Born on April 24, 1884, Sir Ardeshir Dalal received his early education in the Elphinston College, and studied later at St. John's College, Cambridge. Entering the Indian Civil Service in 1908, he distinguished himself in various capacities before he became Secretary to the Government of Bombay in the Finance Department. He was a member of the Bombay Legislative Council in 1926. In the following year he was called to officiate as Secretary to the Government of India, Department of Education, Health and Lands. In 1928, he returned to Bombay as Collector and Municipal Commissioner.

On retiring from the Commissionership and the I.C.S. in 1931, Sir Ardeshir joined Tatas as a Director. Under his able guidance the Tata Iron and Steel Company grew from strength to strength. Besides being Director of various other Tata concerns, he was also a Director of the Central Bank of India and the Associated Cement Companies.

During the war in 1941, he was invited to act as Liaison Officer in India for the Ministry of Supply and in August 1944, he became a Member of the Viceroy's Executive Council and was placed in charge of the newly created Department for Planning and Development. Sir Ardeshir was one of the leading sponsors and signatories of the well-known Bombay plan for India's Industrial regeneration. In May 1945, he visited the United Kingdom to discuss problems connected with post-war economic development of India, particularly in the industrial field, and acquainted himself with the situation regarding the availability of capital goods and the training of expert students and technicians. He also visited the U S.A. to study the possibility of obtaining necessary industrial machinery for factories and mills. In January 1946, he tendered his resignation from the Viceroy's Executive Council for personal reasons. During this short period of his connection with the Government of India, he formulated a plan for the overseas training of technical personnel; it was in pursuance of this plan, that the Government of India deputed several batches of students for higher training in research and technology in the United Kingdom and the U.S.A. He was knighted in 1946.

Sir Ardeshir was deeply interested in the progress of science in all its aspects; he was to a large extent responsible for inspiring the creation of the Tata Institute for Fundamental Research under the distinguished Directorship of Professor Bhabha. He was closely connected with the progress of the Indian Institute of Science and was elected Chairman of the Court in June 1947.

## FIAT REVIEWS OF GERMAN SCIENCE

A FEW months back this office received for distribution one dozen copies each of six titles of the *Fiat Reviews* of German Science for 1939-1946 and offered them to some selected institutions of India and the neighbouring countries of South Asia on the basis of the specialised subjects of their research activities. It was the intention of the awarding authorities that these volumes should be sent to those who are actually engaged in research on the specialised subjects. Of the remaining titles of these Reviews a recent consignment of 31 titles has just been received at this office. The titles are broadly divided under headings of Physics, Chemistry, Mathematics, Biology and Sciences of the Earth. The number of copies available for distribution is again limited but as there are more of the specialised branches of studies, there may be opportunities for a wider distribution of the individual titles like Nuclear Physics, Hydro and Aerodynamics, Analytical Chemistry, Chemotherapy, Surgery, Pathology, etc. Interested institutions will kindly help this office by sending their subjects of research mentioning at the same time the directors of research on those special fields. This latter information will be helpful to the office in future for locating the active centres for contact with outside world. It is likely that some institutions have already got all *Fiat* volumes from governmental source and such institutions may kindly inform this office in order to keep a list of sources of the availability of *Fiat Reviews* and eventually to direct the enquirers nearer those sources.—[By courtesy of UNESCO Office of South East Asia, Delhi.]

# LETTERS TO THE EDITOR


| | Page |
|---|---|
| *On the Photo-Sensitivity of Neon Lamps and their Use in Cosmic-Ray Circuits*—Om Parkash | 400 |
| *On a Stellate Discocycline from the Upper Eocene of Surat-Broach Area (Bombay Presidency)*—B. S. Tewari | 401 |
| *Germination of Double Grained Paddy in Relation to the Anatomy of Lemma and Palea*—G. V. Chalam | 401 |
| *Vanadametry—Part V. Volumetric Estimation of Uranium with Sodium Vanadate*—M. Narasimhasastri and G. Gopala Rao | 402 |
| *Dielectric Constants of Cashew Shell Oil*—B. R. Y. Iyengar and S. Krishnamurthy | 403 |
| *The Temperature of Zero Conductance of Certain Dyestuffs*—Satya Prakash and Tej Narain Shivapuri | 403 |
| *Occurrence of D-Mannitol in the Exudation of* Olea glandulifera—J. Sri Ram and P. L. Narasimha Rao | 404 |
| *A Synthesis of Prunetin*—R. N. Iyer, K. H. Shah and K. Venkataraman | 404 |
| *Manufacture of Taurine*—M. V. Vakilwalla and D. M. Trivedi | 406 |
| *Effect of Streptomycin on Glycerine Vaccine Lymph (Calf Lymph)*—V. N. Krishnamurthy | 406 |
| *Some Observations on the Biology of* Tetrastichus hagenowii, *Ratz.—An Egg Parasite of the House-Cockroach* (Periplaneta americana, L.)—Syed Usman | 407 |
| Microbracon hebetor *S., and* Stenachroia elongella *H.*—M. Appanna | 408 |
| *Chromosome Numbers in Indian Economic Plants—III.* S. Sampath and K. Ramanathan | 408 |
| *Hormone Induced Set and Parthenocarpy in Mango* (Mangifera indica *L.*)—L. Venkataratnam | 409 |
| *Protogyny in Indian Forms of* Saccharum spontaneum—Sunil Kumar Mukherjee | 410 |
| *On the Chromosomes of a Cricket,* Liogryllus Bimaculatus—M. K. Dutt | 411 |
| *Necrosis in Tomato* (Lycopersicum esculentum *Mill.*)—R. S. Vasudeva, R. P. Garga and R. N. Azad | 411 |
| *Photoperiodic Response in Some X-Ray Mutant Wheats*—Gadadhar Misra | 413 |
| *Effect of Vernalization and Photoperiodic Treatments on Grain Development in Wheat*—J. J. Chinoy | 414 |
| *Proliferation of Grass Spikelets*—T. J. Jenkin | 414 |
| *Occurrence of Turions in* Elodea canadensis—K. M. Safeeulla and H. C. Govindu | 414 |
| *On the Nectary in the Stamens of* Memecylon heyneanum *Benth.*—K. Subramanyam | 415 |
| *Cicindelids from Krusadai Island and Kutikal Point in the Gulf of Mannar*—J. Samuel Raj and K. V. Verghese | 416 |
| *A Possible Explanation of the Joshi Effect*—Saiyid Shamim-Ahmad and M. V. Ramanamurti | 416 |
| *Artificial Infection of Sorghum with Long Smut*—T. S. Ramakrishnan and G. S. Reddy | 418 |
| *Ultra-Violet Absorption Spectrum of Iodobenzene*—K. Sreeramamurty and K. R. Rao | 418 |


## ON THE PHOTO-SENSITIVITY OF NEON LAMPS AND THEIR USE IN COSMIC-RAY CIRCUITS

Observations of the author and Sarna[1] have shown that neon lamps exhibit a kind of photo-sensitivity, and that this affects the performance of cosmic-ray circuits employing such lamps. Yeater[2] met the difficulty by putting some extra lamps to produce continuous diffused illumination.

To test this fact, three lamps were exposed to different types of light in front of a 250-watt Phillips mercury lamp. The various voltages were measured by a 'Weston Analyzer' of resistance 20,000 ohms/volt. The results are shown in Table I.

Table I

| | Lamps | Flashing voltage with Stray Light | Direct Illumination | Blue Filter | Green Filter | Yellow Filter |
|---|---|---|---|---|---|---|
| | | volts | volts | volts | volts | volts |
| 1 | G.E.C. NE-17 | 70 | 60 | 65 | 70 | 70 |
| 2 | G.E.C. NE-2 | 67·5 | 60 | 62·5 | 67·5 | 67·5 |
| 3 | G.E.C. E5541-A-F-36 (Argon) | 90 | 87·5 | 90 | 90 | 90 |

It is clear from tne above that the flashing voltage is lowered when the neon lamps are under illumination, more so with blue light. It was further observed that once

the lamps started glowing there was no effect of light on the current flowing or on the voltage across the lamp.

In view of the above, the use of neon lamps should be avoided in such circuits, or if used, the lamps must be painted red so that they become immune to light effect.

The author is grateful to Mr. B Bhowmik of the Delhi University Physics Department, Delhi, for providing facilities for this work and Messrs. Jugal Kishore, M.Sc. (D. U.) and S. K Suri, M.Sc. (N. P. L.), for helping and lending the apparatus needed.

East Punjab University, OM PARKASH.
Physics Department,
Government College,
Hoshiarpur,
*October* 17, 1949.

1. Parkash, Om, and Sarna, H. R., *Ind. Jour. Phys.*, 1948, **22**, 19. 2. Yeater, Max, L., *Phys. Rev.*, 1945, **67**, 74.

## ON A STELLATE DISCOCYCLINE FROM THE UPPER EOCENE OF SURAT-BROACH AREA (BOMBAY PRESIDENCY)

STELLATE discocyclines are important in the zonal classification of the Eocene beds; and from India and neighbouring regions the following are known:

1. *Orbitoides asterifera*—Described by Carter[1] from the Laki horizon of the Kelat-valley in Baluchistan. Only the external characters are known and from Carter's description it appears to be an *Asterocyclina*.

2. *Actinocyclina alticostata*—Described by Nuttall[2] from the Middle Kirthar horizon of Kutch.

*Actinocyclina* cf. *crassicostata* Douville' × 5½.
Upper Eocene of Bhodan, near Surat.

3. *Pseudophragmina* (*Asterophragmina*) *pagoda*—Described by S. R. N. Rao[3] from the Yaw stage (Priabonian) of Burma.

The stellate discocycline now being recorded was collected by the author from the *Pellatispira*-bed of the Surat-Broach area to which an Upper Eocene age has been assigned.[4, 5] The fossil has a discoidal test with a mamelon in the centre. In complete specimens radial ridges do not extend beyond the periphery of the test. The specimen figured is 6·3 mm. in diameter. An axial section shows that the radial ridges are built by lateral chambers as in the genus *Actinocyclina* as now defined by Brönnimann.[6] The fossil is unlike any discocycline so far described from India, and appears to be very close to, if not, identical with *Actinocyclina crassicostata* which Douville'[7] has described from the Priabonian (Upper Eocene) of France.

I am indebted to Prof. S. R. Narayana Rao, for his guidance.

Dept. of Geology, B. S. TEWARI.
University of Lucknow,
Lucknow,
*September* 17, 1949.

1. Carter, *Journ. Bomb. Br. Roy. Asiat. Soc.*, 1861, **6**, 78-79. 2. Nuttall, *Rec. Geol. Surv. Ind.*, 1926, **59**, 151. 3. Rao, S. R. N., *Rec. Geol. Surv. Ind.*, 1942, Prof. Paper 12. 4. —, *Journ. Mys. Univ.*, 1941, **2**. 5. —, *Proc. Nat. Acad. Sci.*, 1944, **14**. 6. Brönnimann, *Eclog. Geol. Helvet.*, 1945, **38**, 574. 7. Douville', *Bull. Soc. Geol. Fr.*, 1922, **22**.

## GERMINATION OF DOUBLE GRAINED PADDY IN RELATION TO THE ANATOMY OF LEMMA AND PALEA

IN the germination of double grained paddy a peculiarity was observed. Embryos in the primary and secondary kernels are located facing the lemma and palea respectively. When the double grained paddy seeds are kept for germination, only the embryo facing lemma germinates, while one facing the palea does not. It was suspected that the embryo facing the palea may not be viable. Naked primary and the secondary kernels were taken out of the pericarp and put to germination test. It was found that the embryos in both the kernels germinated, but the embryo in the secondary kernel grew less vigorously. The mechanical obstruction of the palea apparently prevented the germination. In the embryo in the secondary kernel of order to confirm the same, anatomy of both

lemma and palea was studied in serial sections.

Structure of the lemma at the basal end, where the embryo is located, is quite different from the other portions of the same. Throughout its length (5 to 8 mm.) the hypodermal cells under the midrib are not lignified. These cells are small in size and thinwalled. Absence of lignified hypodermal tissue gives the appearance of a slit at this portion. Epidermal cells also are small in size compared to the neighbouring epidermal cells. Further the epidermal cells at other portions are corrugated with incrustation of silica on both sides while at this place they are smooth-walled and devoid of any instruction of silica or trichomes (Fig. 1).

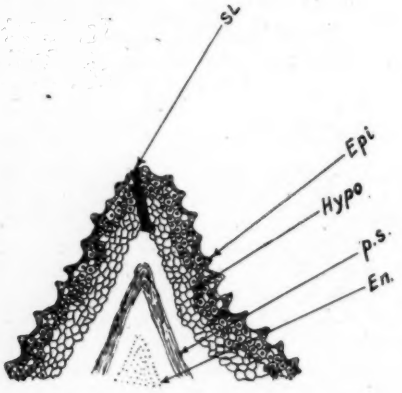



FIG. 1. T. S. of lemma at the basal portion
*Epi*—Epiclumis. *Hypo*—Hypodermis. *SL*—Slit—like portion of the lemma where the cells of the hypodermis are not lignified through which embryo emerges. *p. s.*—perisperm. *En*—Endosperm.

In the structure of the palea the outer epidermal cells exhibit similar lignifications and silicifications as those found in the lemma. The epidermal cells are slightly smaller in size in general and particularly they are very much reduced where the palea is clasped by the margins of lemma. The hypodermal cells are thickened and lignified. The structural peculiarity found in the case of lemma near the embryo is not found here. There are no rows of thinwalled cells below the midrib as found in the case of lemma.

During germination the pericarp is pushed through by the coleorhiza leaving a cavity in front of the rootcap. Primary root soon elongates and fills the cavity. On further growth the root extends upwards in the direction of epicotyl for a short distance before it responds positively to the stimulus of gravity. About this time the coleoptile also emerges splitting open the lemma at the particular portion described above. In the case of palea the lignified hypodermal tissue offers mechanical resistance for the growth of the embryo in the secondary kernel which is also less vigorous than the primary embryo. Consequently there is no germination.

To establish mechanical obstruction of the palea over the embryo in the secondary kernel, half the palea was finely scalpeled when the embryo in the secondary kernel germinated behind the embryo in the primary kernel.

The author's thanks are due to Dr. P. K. Parija and Mr. K. Ramiah for their valuable suggestions and assistance.

G. V. CHALAM.
Land Reclamation Scheme,
Damodarpur,
P. O. Sukinda,
Cuttack (Orissa),
*September* 9, 1949.

## VANADAMETRY—PART V
### Volumetric Estimation of Uranium with Sodium Vanadate

THE present communication deals with the determination of $U^{++++}$ with sodium vanadate as a reagent. A known volume of a 0·05 N solution of uranyl sulphate was reduced in a Jones Reducter according to the directions given by Lundell and Knowles and later treated with a stream of purified air for five minutes. The titration of the resulting $U^{++++}$ solution with a standard solution of sodium vanadate was not found feasible, when diphenyl benzidine was used as indicator, because of the extremely slow development of the colour of the indicator. The difficulty is overcome by adding ferric alum solution in excess of that required for the reaction.

$$U^{++++} + 2Fe^{+++} \rightarrow U^{++++++} + 2Fe^{++}$$

We have tried another and a novel way of overcoming the difficulty of the slowness of the end point in the titration of $U^{++++}$ with sodium vanadate. Our experiments have shown that an overall concentration of 0·01 N oxalic acid is enough to catalyse the

sharp development of the indicator colour by a drop of 0·05 N vanadate solution at a temperature of 50°. In the following

TABLE I

Reduced uranium solution + excess $Fe^{+++}$ + 5·0 ml. of phosphoric acid (1·75 sp. gravity) + 1·0 ml. of 0·1% diphenyl benzidine. Total volume of solution 300 ml. (overall concentration of sulphuric acid above 1·0 N).

| Milli equivalents of uranium | |
|---|---|
| Dichromate method | Vanadate method |
| 0·5095 | 0·5120 |
| 0·4076 | 0·4076 |
| 0·2540 | 0·2540 |
| 0·2038 | 0·2036 |

experiments, the $U^{++++}$ solution was rapidly brought to 50° C. in two to three minutes after addition of 3.0 ml. of 1. 0 N oxalic acid and 1.0 ml. of diphenyl benzidine and then quickly titrated with standard sodium vanadate solution to a blue violet colour. The results recorded in Table II show that this direct method also gives accurate results.

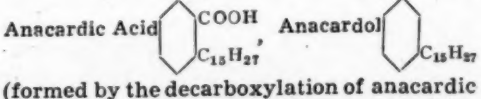
TABLE II

| Amount of uranium found (in milli equivalents) | |
|---|---|
| Ceric sulphate method | Vandate method |
| 0·9370 | 0·9340 |
| 0·4298 | 0·4303 |
| 0·3016 | 0·3009 |
| 0·7013 | 0·7030 |
| 0·3562 | 0·3557 |
| 0·6050 | 0·6046 |

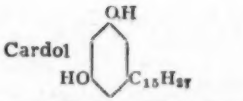
Andhra University, M. NARASIMHASASTRI.
Waltair, G. GOPALA RAO.
*August* 25, 1949.

## DIELECTRIC CONSTANTS OF CASHEW SHELL OIL

THE dielectric constants of commercial cashew shell oil, the main constituents of which are:—




(formed by the decarboxylation of anacardic acid during the initial heat treatment of the raw oil) and




have been studied. The investigations conducted on six commercial samples from various sources of different compositions reveal:—

(1) Cashew shell oil can be distinguished from cocoanut, linseed, olive, poppy seed, perilla, rape seed, sesame and tung oils (dielectric constants ranging from 3·0 to 3·6 [1-5] at room temperature and audio frequency), by its decidedly higher dielectric constant (4·6). Castor oil has nearly the same dielectric constant as cashew shell oil.

(2) The dielectric constant of the bicarbonate soluble constituent increases continuously with temperature between 30 to 100° C. The neutrals which form a small portion of the oil have a low dielectric constant with a negative temperature coefficient. Temperature variation of the dielectric constant of the oils and their respective bicarbonate insolubles differs considerably. This is attributed to viscosity effects due to self-polymerized products and to the different proportions of anacardol in the two cases.

Complete experimental details are being published elsewhere.

Gen. Chem. Labs., B. R. Y. IYENGAR.
Ind. Inst. of Science, S. KRISHNAMURTHY.
Bangalore 3,
*October* 4, 1949.

1. Bhattacharya, *Ind. Jour. Phy.*, 1936, **10**, 290. 2. Caldwell and Payne, *Ind. Eng. Chem.*, 1941, **33**, 954. 3. Hazelhurst, *Paint Manfr.*, 1943, **13**, 273. 4. Paranjpe and Deshponde, *Proc. Ind. Acad. Sci.*, 1935, **A-1**, 880. 5. Stoops, *Jour. Phys. Chem.*, 1931, **35**, 1704.

## THE TEMPERATURE OF ZERO CONDUCTANCE OF CERTAIN DYESTUFFS

KOHLRAUSCH AND GROTRIAN explained the temperature effect on the conductivity of electrolytes by the following equation:

$$X_t = X_0 [1 + c(t - t_0) + c'(t - t_0)^2]$$

$t_0 = 0°$ or 18° C., $c$ being always positive, whereas $c'$ may for some substances become negative.

Using Kohlrausch's data, the equation

$$X_t = X_{18} [1 + c(t - 18) - c'(t - 18)^2]$$

is generally found to hold good for aqueous solutions between 0° and 35° C., where $c' = 0 \cdot 0163(c - 0 \cdot 0174)$. In some cases, $c'$ equals to $0 \cdot 0177(c - 0 \cdot 0177)$. Substituting these values in the above equation, we obtain $X_t = X_{18}[1 + c\ (t-18) + 0.0177\ (c - 0 \cdot 0177)\ (t-18)^2]$. Hence the value of $X_t = 0$ when $t = -38 \cdot 5°$ C., *i.e.*, the conductivity vanishes for aqueous solutions below −39° C.

Studying the temperature of zero conductance for jelly-forming salts of thorium, Prakash[1] and recently Mushran and Prakash[2] have determined its value for various negatively charged colloidal systems. Nine out of twelve substances studied by them attain zero conductance between −20° to −30° C.; that of dyestuffs investigated by us also fall in the same range.

| Dyes* | Zero conductance temperature |
|---|---|
| Methylene Blue .. | − 22·5 |
| Fuchsin .. | − 22·0 |
| Aniline Blue .. | − 21·0 |
| Indigo Carmine .. | − 22·0 |
| Bordeaux B .. | − 22·5 |
| Benzopurpurin .. | − 21·5 |
| Congo Red .. | − 21·5 |
| Aniline Brown .. | − 22·5 |
| Methyl Orange .. | − 22·5 |
| Dianilazurin G .. | − 23·5 |
| Aniline Scarlet .. | − 23·0 |

* Each in 3 concentrations ·05, ·10, ·20 per cent.

Water-soluble dyestuffs are the sodium or potassium salts of dye-forming acids of high molecular weight, or hydrochlorides or sulphates of a dye-base, and consist of : (*a*) ordinary inorganic ions of high mobility; (*b*) a micelle of high molecular weight and low mobility. The former's reaction to temperature will be similar to that of ordinary electrolytes, while the latter will attain zero conductance much earlier when the temperature is lowered. Another contributory factor which is significant in such cases is the association of water molecules, which increases rapidly on lowering the temperature.

Hence it follows that for solutions containing colloidal micelle, the temperature of zero conductance is higher than for ordinary electrolytes. Such would seem to be the case for soaps, dyestuffs, albuminous substances, tannins, etc., and for inorganic colloids.

SATYA PRAKASH.
TEJ NARAIN SHIVAPURI.

The Chem. Labs.,
University of Allahabad,
*August* 29, 1949.

1. *Jour. Phys. Chem.*, 1933, **37**, 907. 2. *Ibid.*, 1946, **50**, 251.

## OCCURRENCE OF D-MANNITOL IN THE EXUDATION OF *OLEA GLANDULIFERA*

A manna-like substance, an exudation from *Olea glandulifera* ("Sugar tree") in the Aiyur forest is reported to appear during draught and is considered to be caused by incisions wrought by insects. Any artificial injury to the tree failed to induce the exudation.

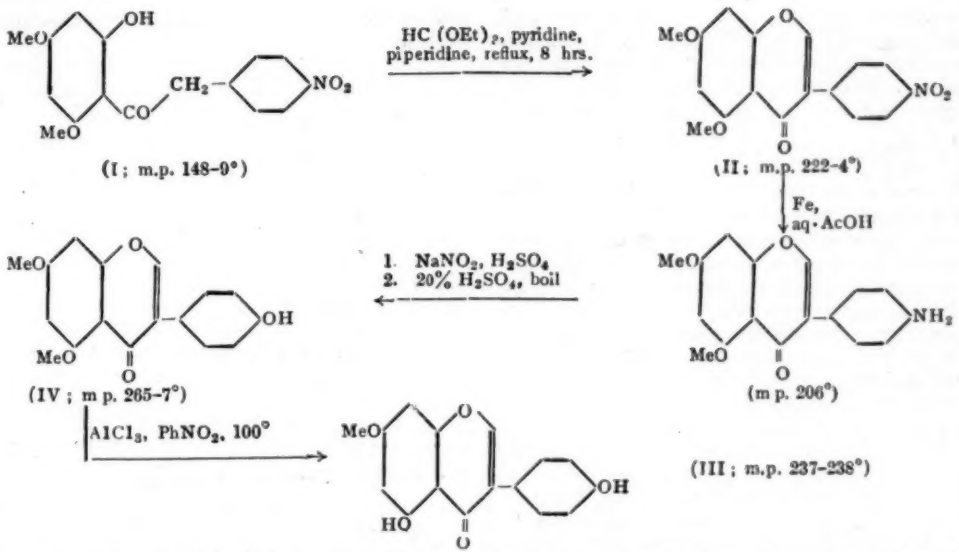
A sample of this pale yellow exudation, collected in 1946, was found after the removal of fibrous material (Ca 5%) to dissolve freely in hot water. It is practically free of ash, and contains only traces of gelatinous matter and reducing sugars. The aqueous solution, on concentration and chilling or by addition of absolute alcohol (3 vols.) after a clarifying treatment with charcoal, deposited pure crystals of D-mannitol, m.p. 165-6° (identified by mixed m.p. with an authentic sample, by optical rotation before and after addition of borax and by the preparation of mannite-tribenzacetol,[1] m.p. 207°) in about 95 per cent. yield on the basis of water-soluble solids.

Dept. of Biochem., J. SRI RAM.
Ind. Inst. of Sci., P. L. NARASIMHA RAO.
Bangalore,
*October* 31, 1949.

1. *Identification of Pure Organic Compounds* by S. P. Mulliken, Vol. I, p. 155.

## A SYNTHESIS OF PRUNETIN

THE action of ethyl orthoformate on 2-hydroxy-4:6-dimethoxyphenyl 4-nitrobenzyl ketone (I) in boiling pyridine containing a little piperidine yields 5:7-dimethoxy-4′-nitroisoflavone (II) in 60% yield. Prunetin (III) has been synthesized from (I) by




the indicated series of reactions. Preferential demethylation of the 5-methoxyl group in (IV) can be effected by means of aluminium chloride in nitrobenzene or hydrobromic acid in acetic acid. Such partial demethylation of the 5- and 3-methoxyl groups in the flavone series, first observed by Bharadwaj[1] and Mahal,[2] and since used for the synthesis of several naturally occurring, partially *O*-methylated flavones and flavonols, has now proved to be of value also in the *iso*flavone group. The *iso*flavone (IV) is a suitable intermediate for santal, recently shown to be 5:3′:4′-trihydroxy-7-methoxy*iso*flavone.[3] The synthesis of santal is in progress. Using the method of Joshi and one of us,[4] Robertson, Suckling and Whalley have synthesized santal trimethyl and triethyl ethers.[3]

Späth and Lederer synthesized the naturally occurring *iso*flavones, daidzein and *pseudo*baptigenin, by condensing the appropriate *o*-hydroxyphenyl benzyl ketone with ethyl formate and sodium at 100° in a sealed tube, treating the product with boiling alcoholic hydrochloric acid, and purifying the *iso*flavones by high vacuum sublimation.[5] The condensation of *o*-hydroxyphenyl benzyl ketones with ethyl formate and sodium usually proceeds smoothly at 0° to yield the *iso*flavone in one stage; but the reaction fails with (I). While Joshi and Venkataraman protected hydroxyl groups other than the 2-hydroxyl, Shriner and Hull have found that this is not necessary in the synthesis of 5:7-dihydroxy-4′-methoxy*iso*flavone (biochanin A) and 5:7:4′-trihydroxy-8-methyl*iso*flavone (8- methylgenistein).[6] We have observed that the reaction may be carried out without protection of the 4-hydroxyl in 2:4-dihydroxyphenyl benzyl ketone, although the 4-benzyl ether gives a better yield; but we have encountered difficulties in the preparation of 5:7-dihydroxy*iso*flavone directly from 2:4:6-trihydroxyphenyl benzyl ketone. However, 2-hydroxy-4:6-dimethoxyphenyl benzyl ketone (m.p. 116°) condenses readily with ethyl formate and sodium to 5:7-dimethoxy*iso*flavone (m.p. 120°), and demethylation with hydriodic acid gives 5:7-dihydroxy*iso*flavone, m.p. 193-194°; partial demethylation with hydrobromic acid in acetic anhydride gives 5-hydroxy-7-methoxy*iso*flavone, m.p. 139-140°.

Details will shortly appear in the *Proceedings of the Indian Academy of Sciences.*

Dept. of Chem. Technology, The University, Bombay,
R. N. Iyer.
K. H. Shah.
K. Venkataraman.

*October* 12, 1949.

1. Bharadwaj and Venkataraman, *Curr. Sci.*, 1933, **2**, 50; Gulati and Venkataraman, *J.C.S.*, 1936, 267. 2. Mahal and Venkataraman, *Curr. Sci.*, 1935, **4**, 311. 3. Robertson, Suckling and Whalley, *J.C.S.*, 1949, 1571. 4. Joshi and

Venkataraman, *ibid.*, 1934, 513; Mahal, Rai and Venkataraman, *ibid.*, 1120, 1769. 5. Späth and Lederer, *Ber.*, 1930, **63**, 745. 6. Shriner and Hull, *J. Org. Chem.*, 1945, **10**, 228, 288.

## MANUFACTURE OF TAURINE

ALTHOUGH several processes exist for synthesising taurine, the method by which it could be made cheaply on a commercial scale was published recently by Goldberg[1] who reacted $\beta$-amino ethyl sulphuric acid with sodium sulphite with or without pressure to obtain a 70 per cent. yield of pure taurine. $\beta$-Amino ethyl sulphuric acid can be made in quantitative yields by sulphonation of ethanolamine after the method of Rollins and Calderwood[2].

The commercial process[3] for the manufacture of taurine as worked by Messrs. I. G. Farben Industries, Germany, consists in the reaction of hydroxyethane sodium sulphonate with $NH_3$ at 200 atmosphere pressure and a temperature of 280°C. under nitrogen coushion The hydroxy ethane sodium sulphonate is obtained by them by reacting a solution of sodium bisulphite with ethylene oxide also under inert atmosphere These methods, as can be seen, are very difficult under present conditions in India.

The difficulty in Goldgerg's method is the separation of pure taurine from the reaction mass. The method employed is not only expensive but involves severe corrosive conditions.

This method is now modified by us with a view to making it attractive for commercial production.* $\beta$-Amino ethyl sulphuric acid (1 mol.) is boiled with sodium sulphite (1·1 mol.) for about 48 hours when the reaction is complete. The solution contains taurine together with sodium sulphate which is formed as a by-product. The boiling solution is then treated with a solution of calcium chloride (25% solution) taking care that no excess is added. Calcium sulphate which is formed settles rapidly. It is filtered and the resulting solution is concentrated to remove sodium chloride. Due to low solubility of sodium chloride, most of it is precipitated. The solution is filtered and then cooled in ice when crystal taurine crystallises, yield 80 per cent. of theory. The resulting solution contains probably ditaurine as a yellow waxy mass. Igepons as marketed by I. G. Farben Industry contains sodium sulphate and sodium chloride as diluents.

For $\beta$-amino ethyl sulphuric acid we used a product marketed by B. F. Goodrich Co., Inc. Cleveland, Ohio, U.S.A., under the name of Goodrite $\beta$-amino ethyl sulphuric acid. It is available as white crystalline solid of 98 per cent. purity at a price ranging around 45 cents f.o.b.

The Kesar Sugar Works Ltd.,
Chemical Division, M. V. VAKILWALLA.
Goregaon, B. S. D., D. M. TRIVEDI.
*August* 23, 1949.

1. Goldberg, *J.C.S.*, 1943, 4. 2. Calderwood, *J.A.C.S.*, 1938, **60**, 2312. 3. Hoechst, *B.I.O.S. Final Report*, **418**, 9.

* Between 2000-3000 tons of Igepons are imported at present annually and used in India in the making of paper, textiles, etc.

## EFFECT OF STREPTOMYCIN ON GLYCERINE VACCINE LYMPH (CALF LYMPH)

CONTRARY to the views held by some workers,[1,2] penicillin is ineffective[3] in reducing microbiological contaminants of vaccine lymph.

Preliminary sterility tests on streptomycin-treated lymphs after its removal revealed that a concentration of 5 mg. per ml of streptomycin was necessary to destroy the staphylococcus group of organisms from the vaccine lymph. The staphylococcal population, about 252 millions per ml. of vaccine lymph before treatment, was reduced to a mere 240 per ml. within 24 hours contact in cold storage (−10°C) with streptomycin in 5 mg. concentration and to 40 per ml., in another week's time. A few of the *B. subtilis* group remained unaffected by streptomycin even in higher concentrations, possibly because of their existence as spores. In combination with 500 units of penicillin, as little as 500$\mu$ gm. of streptomycin per ml., of vaccine lymph gave almost the same result Bigger,[4] Chain & Duthie,[5] Himmelweit[6] and Pulaski, *et. al.*[7] find that certain antibiotics in combination with sulphanamides, bacteriophages or antibiotics produce such a synergistic action.

The potency of vaccine lymph is unaffected both by streptomycin and penicillin in contrast to chloroform which lowers the potency.

This is a finding of considerable practical significance and will not only lead to the preparation of a purer lymph but also contribute towards a substantial lowering in the costs of production.

Vaccine Institute, V. N. KRISHNAMURTHY.
Banglore City,
*October* 17, 1949.

1. Diaz Romero, C., *Arch. Soc. Bio.*, Montevideo, 1945, **12**, 152. (abs. *J.A.M.A.*, 1946, **131**, 400). 2. Patel, T. B., *Ind. Med. Gaz.*, 1948, **10**, 452. 3. Krishnamurthy, V. N., Letter to *Curr. Sci.*, 1949, dated 1-9-49. 4. Bigger, J. W., *Lancet*, 1944, **2**, 142. 5. Chain, E., and Duthie, E. S., *Ibid.*, 1945, **1**, 652. 6. Himmelweit, F., *Ibid.*, 1945, **2**, 104. 7. Pulaski, E. J., *et. al*, *Ann. N. Y. Acad. Sci.*, 1946, **48**, 183.

## SOME OBSERVATIONS ON THE BIOLOGY OF *TETRASTICHUS HAGENOWII*, RATZ.—AN EGG PARASITE OF THE HOUSE-COCKROACH (*PERIPLANETA AMERICANA*, L.)

*Tetrastichus hagenowii*, Ratz. (Hymenoptera, Eulophidæ), is an egg-parasite in oothecæ of the cockroach, first observed in 1932; it has been bred here from the egg-capsules of the three common species *Periplaneta americana*, L., *P. australasiæ*, F., and *Blatta orientalis*, L.

All the pre-adult stages of the parasite are passed well-protected within the egg-capsule of the cockroach. Eggs are laid by the female parasite inside the host eggs within the oothecæ. When freshly laid, the egg is smooth, shining and transparent; it is elongate-oval, with the caudal end narrow and somewhat curved; prior to hatching it becomes clouded and assumes a pale yellow colour. The newly hatched larva is smooth, flat and transparent and its segments fairly well defined; the fully grown larva (2·7 to 3·2 mm.) is white, tapering towards extremities, with abdominal segments opaque and dark brown owing to food contents inside; tracheal system well defined. Pupa (1·6 to 2·1 mm.) at first is white with eyes, mouth appendages, leg and wing rudiments clearly defined, later on changes to deep brown in course of chitinisation; the female pupa is bigger than the male pupa.

The period of development of the parasite from egg to adult averaged 23·6 days in October-November 1948, about 6 to 9 days shorter than the incubation period of the egg of the cockroach (*Periplaneta americana*) at this season.

*Period of observation*: 26th October to 24th November 1948.

*Period of development*: 22 to 26 days ± 6 hrs.

*Temperature*: Mean—73·2° F.; Maximum—84·8° F; Minimum—62·3° F.

*Emergence of the Parasites.*—The number of parasites emerging from a host egg-capsule varied from 7 to 48, the average being 32·7. The ratio of females to males was invariably 3:1. Adult parasites escaped by biting holes (1 to 3) in the host egg-capsules, the presence of these emergence holes being the only external symptom of the parasitisation of the host egg-capsules. Emergence of the parasites generally took place in the mornings, and the parasites from one and the same host egg-capsule emerged on the same day. Soon after emergence, they became active, fed on dilute honey and copulated. Several female parasites were fertilised by the one male. The female parasites lived on an average 12·5 days when fed on dilute honey, and 7·8 days without food, the male only 3·4 days.

*Natural incidence.*—The incidence of the parasites was studied from host egg-capsules collected at random in Bangalore periodically.

*Percentage of natural parasitisation of the egg-capsules of* Periplaneta americana, *L.*, by Tetrastichus hagenowii, *Ratz.*

| Period | No. of cockroach egg-capsules | | Percentage of parasitisation |
|---|---|---|---|
| | Examined | Parasitised | |
| July 1947–June 1948 | 495 | 102 | 20·6 |
| July–Dec. 1948 | 288 | 123 | 42·7 |
| July–Oct. 1949 | 178 | 103 | 56·7 |

The parasites were in abundance and most active during the period from September to November; when they parasitised 43·0 to 62·2 per cent. of the host egg-capsules. August to October is also the main egg-laying season of the host cockroach. It was observed that from a number of parasitised host egg-capsules the parasites did not emerge; this appeared to be due to two causes: (i) overpopulation of the developing parasites in the eggcapsule, which stifled their complete

development; and (ii) pre-adult parasites in normal numbers dead on account of excessive dry condition of the host egg; in such cases normal emergence of parasites was secured by sprinkling a small quantity of water on the host egg-capsules at intervals of 3-4 days.

I am thankful to Sri. B. Krishnamurti, Government Entomologist, for encouragement and guidance.

Entomological Laboratory, SYED USMAN.
Agric. Res. Institute,
Bangalore,
*November* 4, 1949.

## *MICROBRACON HEBETOR* S., AND *STENACHROIA ELONGELLA* H.

OUR observations have revealed that *Microbracon hebetor* S.—the common Braconid larval parasite of the rice and flour moth—*Corcyra cephalonica* St.—shows marked preference to the caterpillar of *Stenachroia elongella* H., a field pest of jola (Jowar) earhead in Mysore. (*Microbracon hebetor* S. has also been previously recorded in Mysore, as preferring another field pest, namely, *Adisura atkinsoni* M.—Lab-lab pod-borer.[1,2])

As in the case of *Corcyra cephalonica* St. and *Adisura atkinsoni* M. larvæ, this webbing caterpillar, *Stenachroia elongella* H., is also paralysed by *Microbracon hebetor* S., prior to egg deposition. But unlike in the former two cases, where eggs are deposited on the dorsal, lateral (intersegmental) and ventral surfaces of the host-body, the eggs are invariably deposited on the ventral surface of the caterpillar of *Stenachroia elongella* H. Caterpillars of the third instar and onwards upto the prepupal stage are successfully attacked.

Detached caterpillars of *Stenachroia elongella* H., as well as those *in situ* in the jola earhead, are found attacked by *Microbracon hebetor* S. in the laboratory. Field tests are being planned.

I am thankful to Sri. B. Krishnamurti, Government Entomologist, for encouragement and guidance.

Entomological Laboratory, M. APPANNA.
Agric. Res. Institute,
Bangalore,
*November* 4, 1949.

1, 2. Krishnamurti and Appanna, *Curr. Sci.*, 1944, **13**, 135; and Krishnamurti and Appanna, *Agril. Coll. Res. Inst. Mys. Ent. Ser., Bull.* No. 13.

## CHROMOSOME NUMBERS IN INDIAN ECONOMIC PLANTS—III

THE cytology of Indian economic plants is being studied on an increasing scale in the various laboratories.[1] In this connection the following list of chromosome numbers counted in some plants are reported. After reference to the Chromosome Atlas[2] and to the recent publications, these are reported as first record for these plants. The list is meant to avoid duplication of work. Incidentally it brings out the prevalence of regularity in chromosome numbers in allied genera and species. It also brings out the part played by polyploidy in angiosperm evolution. Columns four and five give as positive or negative, whether the observed number tallies with recorded numbers in related species, and whether it forms a member in the polyploid series in the plant groups, as classified in the Chromosome Atlas, cited above.

A full discussion of these aspects cannot of course be taken up at the present stage. A few comments on special features are however given.

| Serial number | Name of plant | 2*n* number | Regularity in group | Polyploid series |
|---|---|---|---|---|
| | MIMOSACEÆ | | | |
| 1 | *Prosopis juliflora* DC. | 52 | + | + |
| 2 | *Parkia biglandulosa* W. & A. | 26 | + | + |
| 3 | *Leucaena glauca* Benth. | *c.* 104 | + | + |
| 4 | *Pithecolobium dulce* Benth. | 26 | + | + |
| | PAPILIONACEÆ | | | |
| 5 | *Indigofera dosua* Hamilt. | 16 | + | + |
| 6 | *Gliricidia maculata* Benth. | 20 | + | + |
| 7 | *Mucuna pruriens* DC. | 22 | • | • |
| 8 | *Cassia glauca* Lamk. | 28 | + | + |
| 9 | *Cassia angustifolia* Vahl. | 28 | + | + |
| 10 | *Cassia hirsuta* Linn. | 56 | + | + |
| 11 | *Castonospermum australe* A. Cunn. | 26 | – | – |
| | PEDALINEÆ | | | |
| 12 | *Sesamum occidentale* Heer & Regel | 64 | + | + |
| | GRAMINEÆ | | | |
| 13 | *Eremopogon foveolatus* Stapf. | 40 | + | + |
| 14 | *Andropogon pumilus* Roxb. | 20 | + | + |
| 15 | *Amphilopis pertusa* Stapf. | 40 | + | + |
| 16 | *Cynodon plectostachyum* Pilgr. | 18 | + | + |
| 17 | *Schima nervosum* Stapf. | 34 | – | – |
| 18 | *Oryza australiensis* Domin. | 24 | + | + |
| 19 | *Oryza staphii* Roshev. | 24 | + | + |
| 20 | *Oryza latifolia* (?) | 48 | + | + |

The numbers have been counted in sections of actively growing root tips. The maximum possible number obtained from different intact cells are given. One source

of error is the prevalence of polyploid cells in roots of legumes, and necessary caution has been used. In *Castanospermum* (11) an Australian genus, the 2*n* number does not fit in with that of related genera of other continents, and further studies are necessary. In many grasses, ecotypes show chromosome diversity. The number found in *Sehima* (17) may not be the same in other types and species. In view of this type of variability, other fodder grasses, *Panicum antidotale* Retz., *Brachiaria mutica* Stapf., *Cenchrus ciliaris* Linn. and *Dicanthium annulatum* Stapf. were studied cytologically and numbers tallying with record were counted. In the grass *Eremopogon foveolatus* (13) the 2*n* number was 40 and not 45, both numbers having been recorded. In the genus *Mucuna* (7, Syn. *Stizolobium*) other species have to be studied to see if the count made, tallies. In the wild sesamums, a new species *Sesamum occidentale* (12) was procured from Ceylon and grown. The number was counted in root tips as well as pollen mother cells and is a tetraploid compared to *S. laciniatum* and and *S. prostratum*.

In the important genus Oryza, two species *O. australiensis* (18) and *O. Stapfii* (19) were imported and grown for cytogenetical studies. About the species *O. latifolia* (20) there is some doubt. This was identified as *O. latifolia* Desv. but is not *O. latifolia* of Hooker and was obtained from Tropical America. It seeds freely and seedlings have the number 2*n*=48 and not 24 as recorded previously.

We are indebted to many members of the Agricultural Department, for help in all stages in this work.

Cytogenetics Laboratory, S. SAMPATH.
Agric. Res. Institute, K. RAMANATHAN.
Coimbatore,
*October* 19, 1949.

1. Krishnaswamy, N., and Raman, V. S., *Curr. Sci.*, 1949, **18**, 378. 2. Darlington, C. D., and Janaki Ammal, E. K., 1945, London.

## HORMONE INDUCED SET AND PARTHENOCARPY IN MANGO (*MANGIFERA INDICA* L.)

IN mango inflorescence ranging from 2000 to 6000 flowers, hardly 1% reach maturity; the rest are either males or drop off before setting. According to Bijhouwer,[1] Naik[2] and Mukherjee[3] nearly two-thirds of the bisexual flowers are not pollinated; hence the low fruitage in mango.

To investigate the effect of β-naphthoxyacetic acid on mango fruit set, mature buds were selected in *Neelum*, *Bangalore* and *Banganapalle*, three reputed South Indian varieties. The staminate flowers were nipped off and only 20 to 30 bisexual flowers were retained in an inflorescence after emasculating the single stamen. The emasculated flowers were sprayed with water containing 10 p. p. m. of β-naphthoxyacetic acid and were immediately covered with cellophane paper to prevent pollination. A fortnight later, when fruit set was noticed, the covers were removed. The percentage of flowers developing were 26·0, 18·4 and 2·3 per cent. for *Neelum*, *Bangalora* and *Banganapalle* respectively, as against 12·3, 6·9 and 1·3 obtained normally. After reaching marble size the flowers dropped off due to external disturbances.

The fruits on examination showed parthenecarpic development (*vide* photograph).

FIG. 1

The fruits looked like normal ones with well developed mesocarp and endocarp, but the embryo was found completely inhibited in growth with a shallow cavity inside the endocarp or stone. The ovary tissues in mango are found to respond differently to β-naphthoxyacetic acid, resulting in parthenocarpic developent. Some improvement in fruit set was also noticed. These preliminary observations open up a fertile field for improving fruitage in mango through hormone treatment.

L. VENKATARATNAM.
Plant Physiology Laboratory,
Agricultural College, Bapatla,
*August* 17, 1949.

1. Bijhouwer, Z. P. C., *Sci. & Cul.*, 1949, **15**, 1. 2. Naik, K. C. and Mohan Rao, M., *Ind. Jour. Hort.*, 1943, **1**, 107. 3. S. Mukherjee, *Sci. & Cult.*, 1949, **5**, 5.

## PROTOGYNY IN INDIAN FORMS OF *SACCHARUM SPONTANEUM*

PROTOGYNY in only one African form (*Uganda*) of *Saccharum spontaneum* (known as 'Kans' in Hindi) was reported by Dutt and Krishnaswami,[1] but not in any Indian form uptill now. An examination of the *Spontaneums*, collected by the writer under the *Spontaneum Expedition Scheme*, financed by the Indian Central Sugarcane Committee, shows that 4 types (SES* 29, 32 B, 65 and 66) out of the 94 collected so far are protogynous. The phenomenon is not so conspicuous as in the *Uganda* form, as the stigmas do not project out of the glumes. But the glumes are found to open out making the bright maroon-pink coloured stigmas well exposed, at least 24 hours earlier than the bursting of anthers in the same flower (Figs. 1 & 2).

FIG. 1. Showing an enlarged drawing of a normal and a protogynous flower.

The receptivity of the stigmas in the protogynous flowers of the above types was tested by the setting of seeds and their germination, after bagged pollination of emasculated flowers. SES 29, 32 B, 65 and 66 were used as mothers, selected branches of which were emasculated and bagged after pollination with the pollen from SES 69, 44, 66, 44 and 71 respectively. The seeds collected from the pollinated branches germinated, whereas in the 'general crosses' (where the panicles were kept as it is) most of the seeds did not germinate. SES 66 showed better receptivity and SES 44 is indicated to be a good pollen parent. Direct observation of the stigmatic branches after pollination also shows that the pollen germinates on the stigma, giving out long tubes.

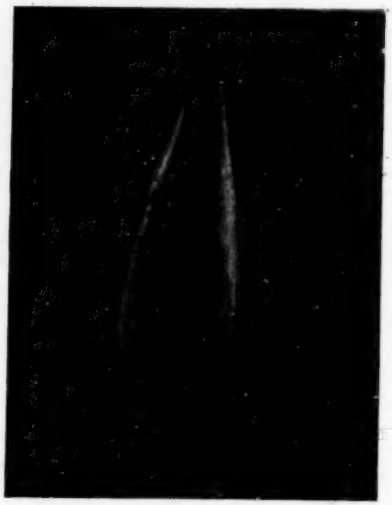


FIG. 2. A microphotograph of a protogynous flower. Note the prominently exposed stigma and unopen anther.

The present observation regarding the occurrence of protogyny in the Indian forms of *S. spontaneum*, and the receptivity of the stigmas at that stage has opened up the possibility of using the Indian spontaneums also as female parents in sugarcane breeding. This will have a definite use also in genetical studies.

Thanks are due to Sri. N. L. Dutt, Sugarcane Expert, Coimbatore, for formulating the scheme and for keen interest in the work.

SUNIL KUMAR MUKHERJEE.
Spontaneum Expedition Scheme,
Indian Sugarcane Breeding Station,
Lawley Road P.O.,
Coimbatore,
*July* 6, 1949.

---

1. Dutt, N. L., and Krishnaswamy, M. K., *Curr. Sci.*, 1943, **12**, 24–26.

* SES means '*Spontaneum Expedition Scheme*'.

## ON THE CHROMOSOMES OF A CRICKET, *LIOGRYLLUS BIMACULATUS*

ACCORDING to Japanese workers the X-chromosome in crickets is metacentric. The two exceptions are *Cyrtoxiphus ritsemæ* and *Homœogryllus japonicus* (Ohmachi [1,2]). The present work reports on the X-chromosome and the diploid number of chromosomes in an Indian cricket from Ballygunge in Calcutta.

Testes and ovaries of the material were fixed in Flemming's without acetic acid and also in Belling's modification of Navaschin's mixture. The gonads after sectioning were stained in both iodine crystal violet and Feulgen's stain. The chromosome number was found to be $2n=23$ in the male and $2n=24$ in the female. The complement in the male is composed of (1) an unpaired, metacentric X-chromosome, (2) a pair of V-shaped chromosome and (3) 10 pairs of rod-shaped ones of various sizes (Fig. 1).

FIG. 1. Spermatogonial metaphase of *Liogryllus bimaculatus* ×2270.

FIG. 2. Metaphase plate from the follicle cell of ovary ×2625.

FIG. 3. Side view of first metotic metaphase showing the "X" lying off the plate. × 1750.

The sex chromosome was found to be the biggest in the complement with two arms unequal. It showed almost always an irregular outline and never became fully nucleinated like the autosomes even at late spermatogonial metaphase stages. The female complement differed from that of the male in having a pair of metacentric X-chromosomes (Fig. 2). The sex chromosomes of the female set were studied from the follicle cells of the ovary and they did not show any heteropycnotic behaviour. The X-chromosome in the prophase of meiosis in the male resembled sometimes a bent rod, split along its length and highly nucleinated, and at other times a compressed mass situated at the periphery of the nuclear membrane. In the first meiotic metaphase this chromosome formed an accessory plate in most cases (Fig. 3), and also showed negative heteropycnosis. Lagging of the sex chromosome was noted in some nuclei. The second division metaphase plates contained either 11 or 12 chromosomes showing that the first meiotic division of the male is reductional for the sex chromosome.

The work was carried out in the Cytogenetical Laboratory of the Department of Zoology, Calcutta University. Thanks are due to Dr. S. P. Ray Chaudhury for criticism and to Prof. B. R. Seshachar, Bangalore, for identification.

Animal Genetics Section, M. K. DUTT.
Indian Vet. Res. Institute,
Izatnagar (U.P.),
*August* 9, 1949.

1. Ohmachi, F., *Proc. Imp. Acad. Japan.*, 1927, 3, 451. 2. —, *Bull. Mie. Coll. Agri. For.*, 1935, No. 5, 1.

## NECROSIS IN TOMATO (*LYCOPERSICUM ESCULENTUM* MILL.)

TOMATO PLANTS (*Sutton's Early Market Variety*), when inoculated with leaf extract of potato plants showing severe crinkling and mottling, repeatedly produced veinal necrosis and necrotic spots. The disease was reproduced easily by sap inoculation to healthy tomato plants (Fig. 1).

FIG. 1

The inoculation tests were mostly conducted during February-March at Delhi in the insect proof house. The first symptom of the disease in the form of curling of leaves

with slight inward rolling of margins appears 20 to 22 days after inoculation, followed by both veinal and foliar necrosis. Necrotic streaks are also produced on the petioles. Transient mottling is observed only in early stages. The infected plants are dwarfed and tend to shed their leaves.

The disease from tomato plants was tarnsmitted to *Nicotiana tabacum* L., *Datura stramonium* L., *Solanum nodiflorum* Jacq. *Petunia hybrida compacta* Vilm., by mechanical inoculation but no symptoms were produced on plants of *Lagenaria leucantha* (Dusch.) Rusby. On *Nicotiana tabacum*, variety *Harrison's special*, five days after inoculation circular mottle was observed. This was followed by vein clearing of younger leaves and green vein banding. In the case of *Datura stramonium* (Fig. 2) persistent, interveinal mottle was observed 5 to 10

FIG. 2

days after inoculation but no necrosis developed. On *Solanum nodiflorum* characteristic yellowish veinal mosaic was produced whereas *Nicotiana glutinosa* developed chlorotic spots and vein clearing. Puckering and necrotic flecks were also observed on the leaves. On *Petunia hybrida* distinct pale blotchy mottle on the leaves and sepals with vein clearing developed.

The reactions on different hosts indicate that the tomato plant showing necrosis was infected both with *Solanum viruses* 1 and 2. Further tests with *Solanum virus* 1 filtered through *Datura stramonium* failed to produce the typical symptoms of the disease. It was not possible to eliminate *Solanum Virus* 1 by making inoculations of the mixture to *Petunia* as the variety of *Petunia* plants under test was found susceptible to it, and in order to separate *Solanum Virus* 2 from the mixture tomato shoots showing the disease were grafted to U.S.D.A. potato seedling 41956 which is known to be resistant to *Solanum Virus* 1. The potato plants exhibited veinal necrosis and leafdrop streak. Scions from the potato plants were grafted back to healthy tomato plants but no necrosis was produced on tomato plants even after one month.

Smith[5] has described necrosis in tomato caused by the interaction of *Nicotiana Virus* 1 and *Solanum Virus* 1 in which case gross lesions develop longitudinally in the stem and necrotic spots on the leaves. The young tomato plants are usually killed by the disease whereas in the case of the disease under report the affected plants neither produce lesions on the stem nor the plants are killed.

Samson[4] observed necrosis in tomato induced by a strain of *Nicotiana Virus* 1. Also Linn and Anderson[3] reported a similar disease. Doolittle and Beecher[1] described a mosaic disease due to a strain of tobacco mosaic virus on tomato causing necrosis and shrivelling of the foliage.

Dykstra[2] has, however, observed necrosis of tomato leaves as a result of inoculation with the extract of potato plants infected with rugose mosaic.

Tests conducted here rule out the presence of *Nicotiana Virus* 1 and show that either of the components of the virus transmissible to *Datura stramonium* or to U.S.D.A. pototo seedling 41956 is not able to produce the disease on tomato independently so that the necrosis observed on tomato has been brought about jointly by *Solanum Viruses* 1 and 2.

Thanks are due to Dr. S. P. Doolittle, Senior Plant Pathologist, U.S.D.A., for his helpful criticism.

R. S. VASUDEVA.
R. P. GARGA.
R. N. AZAD.

Division of Mycology
and Plant Pathology,
Indian Agric. Res. Institute,
New Delhi,
*September* 26, 1949.

1. Doolittle, S. P., & Beecher, F. S., *Phytopath.*, 1942, **32**, 11, 985-94. 2. Dykstra, T. P., *Jour. Agric. Res.*, 1933, **47**, 1, 17-32. 3. Linn, M. B. & Anderson, H. W. "The Plant Disease Reporter," 1942, **26**, 21, 452-54. 4. Samson, R. W., *ibid.*, 1942, **26**, 16, 361-64. 5. Smith, K. M., A "Text-Book of Plant Virus Diseases" (J. & A. Churchill Ltd., London).

## PHOTOPERIODIC RESPONSE IN SOME X-RAY MUTANT WHEATS

STUDIES on photoperiodism of wheat under Indian conditions have been carried out by Pal and Murty,[1] Kar,[2] Chinoy and Nanda.[3] The present investigation is directed towards a study of the stage of optimum response to photoperiods in two new strains of wheat, R-1 (Sarojini) and R-9 (Vijaya), proved to be the best (Pugh[4]) of the eleven varieties evolved by Prof. Ranjan.[5] These mutants vary widely in their morphological and physiological characteristics and the present study has been designed to test if their photoperiodic response follows the general trend of other Indian wheats.

The seeds were sown in earthenware pots (11″×10″) containing well-mixed garden soil and manure. As long-day treatment, a 24-hour photoperiod was used. This was obtained by supplementing the natural day length with artificial illumination from a 1000 watt 'Osram' bulb kept at a distance of 4 feet throughout the night. The long-day treatment was continued till ear-emergence was complete in the individual pots.

FIG. 1

As short-day treatment, an 8-hour photoperiod was used. This was obtained by keeping the pots in daylight daily from 8 a.m. to 4 p.m. and then removing them to a well-ventilated light-proof room for the rest of the time. The exposure to short photoperiod in each individual set commenced at different stages of the vegetative phase (Table I) and was continued in each case for 30 days only after which they were kept outside under natural conditions for the rest of their period of development.

The results are presented in Table I and the condition of the plants under different treatments is shown in Fig. 1.

TABLE I

*The effect of long-day and short-day treatments (at different ages of the seedlings) on ear-emergence*

Sowing date, 27th December 1948. Average of 24 plants. + indicates earliness; − indicates delaying effect.

| Variety of wheat | Age from sowing in days, at which the treatment was commenced | Number of days from sowing to ear-emergence | | Difference from control in days | |
|---|---|---|---|---|---|
| | | Long-day | short-day | Long-day | short-day |
| R-1 | 14 | 38·4 | 71·2 | +23·9 | −8·9 |
| | 21 | 42·9 | 69·4 | +19·4 | −7·1 |
| | 28 | 49·6 | 65·7 | +12·7 | −3·4 |
| | 35 | 51·6 | 64·0 | +10·7 | −1·7 |
| | Control | 62·3 | 62·3 | | |
| R-9 | 14 | 38·0 | 65·1 | +21·6 | −5·5 |
| | 21 | 42·3 | 62·1 | +17·3 | −2·5 |
| | 28 | 47·8 | 61·2 | +11·8 | −1·6 |
| | 35 | 50·6 | 59·8 | + 9·0 | −0·2 |
| | Control | 59·6 | 59·6 | | |

Table I shows that long-day conditions during the vegetative phase bring about significant earlier ear-emergence in both the mutants and that the effect is more pronounced if the long days are applied at the early seedling stage. As the seedlings become older, the long photoperiods produce less and less effect in inducing earliness. It was found that short-day treatment always retards flowering, the effect gradually diminishing as the treatment is applied later and later in the advancing age of the plant.

The present study clearly shows that the mutants under investigation resemble the other Indian varieties in the general trend of their photoperiodic response, and that long-day treatment during their vegetative phase accelerates their normal life-cycle, although as such they tolerate the available short days of India and set good grains.

Thanks are due to Professor Shri Ranjan for his interest and guidance.

Dept. of Botany, GADADHAR MISRA.
University of Allahabad,
*September* 14, 1949.

1. Pal, B. P., and Murty, G. S., *Ind. Jour. Genet. and Pl. Breed.*, 1941, **1**, 61-86. 2. Kar. B. K., *Nature*, 1946, **157**, 811. 3. Chinoy, J. J., and Nanda, K. K., *Ind. Jour. Agric. Sci.*, 1946, **16**, 390-399. 4. Pugh, B. M., *Allahabad Farmer*, 1945, **19**, 131-142. 5. Ranjan, S., *Proc. Ind. Acad. Sci.*, 1940, **12**, 62-68.

## EFFECT OF VERNALIZATION AND PHOTOPERIODIC TREATMENTS ON GRAIN DEVELOPMENT IN WHEAT

HIGHLY significant negative correlations between yield, 1000-grain weight and mean maximum temperature of the ripening period have already been reported elsewhere.[2] When the temperature of the ripening period exceeded a certain level the grain filling processes in wheat were affected and as a consequence of which the grain remained shrivelled and the yield was reduced.

In order to confirm the general applicability of the abovementioned result as well as to make sure that the effect of the temperature of the ripening period on yield and 1000-grain weight of wheat is paramount over other factors, vernalization and photoperiodic treatments were given to a number of wheat varieties selected from different flowering classes, for accelerating or retarding their developmental processes and thus synchronizing their ripening periods, either with a lower temperature range during February-March (75-80° C.), or with a higher temperature range during April-May (90-95° C ). Details of some of these experiments have already been given elsewhere.[1,3,4] When flowering in early wheat varieties, like N. P. 165, Khapli and others, was delayed in order to shift the ripening period to hotter months, the yield per plant was reduced to 3-5 g. from 10-15 g. and 1000-grain weight to 20-25 g. from the normal figure of 40-45 g. The ripening period was also shortened from 50-60 days to 30-35 days. On the other hand, when flowering was accelerated in late varieties like Yeoman II, Kubanka, Vaneum Yakub, and others, by vernalization and photoperiodic treatments, thus making it possible for these varieties to ripen their grain in February-March, it was found that the yield increased from 2-4 g., to 7-10 g., the 1000-grain weight from 15-20 g to 40-45 g. The ripening period was considerably lengthened from 20-30 days to 40-60 days due to lower temperature.

The usefulness of this physiological method of varying environmental conditions may be seen from the fact that the conclusions arrived at earlier[2] have been repeatedly confirmed during the last eight years by experiments on vernalization and photoperiodic responses of wheat carried out at the Indian Agricultural Research Institute, New Delhi, and also at the University of Delhi, Delhi.

Botany Department, J. J. CHINOY.
University of Delhi,
Delhi,
*October* 11, 1949.

1. Chinoy, J. J., and Nanda, K. K., *Indian J. Agri. Sci.*, 1946, **16**, 390. 2. Chinoy, J. J., *Nature* (London), 1947, **159**, 442. 3. —, *Ibid.*, 1949 (in press). 4. Nanda, K. K., and Chinoy, J. J., *Curr. Sci.*, 1945, **14**, 241.

## PROLIFERATION OF GRASS SPIKELETS

IN *Current Science*, August 1949, **18**, No. 8, 301-02, a letter appears entitled 'Proliferation of Spikelets in *Pennisetum Polystachyum*'. For those interested, the following reference may be useful : —

Jenkin, T. J., "Notes on Vivipery in *Festuca Ovina*", *Report for 1921 of the Botanical Society and Exchange Club of the British Isles*. T. Buncle & Co., Arbroath, 1922.

T. J. JENKIN, D.Sc.,
*Director*.

Welsh Plant Breed. St.,
Aberystwyth. Wales,
*September* 28, 1949.

## OCCURRENCE OF TURIONS IN *ELODEA CANADENSIS*

*Elodea canadensis* Michx is a rapidly multiplying common pond weed in South India. Specimens collected during summer when the ponds were rapidly drying up, showed small tuberous structures (Figs. 1 & 2) which proved to be turions reported in the pond weeds of temperate regions.[1]

Plants like *Myriophyllum verticillatum* L. and *Potamogeton* sp., develop turions under adverse conditions and germinate and produce new shoots under favourable conditions. Several of the turions in *Myriophyllum verticillatum* detached from the mother plant during cold season regenerate new shoots in spring.

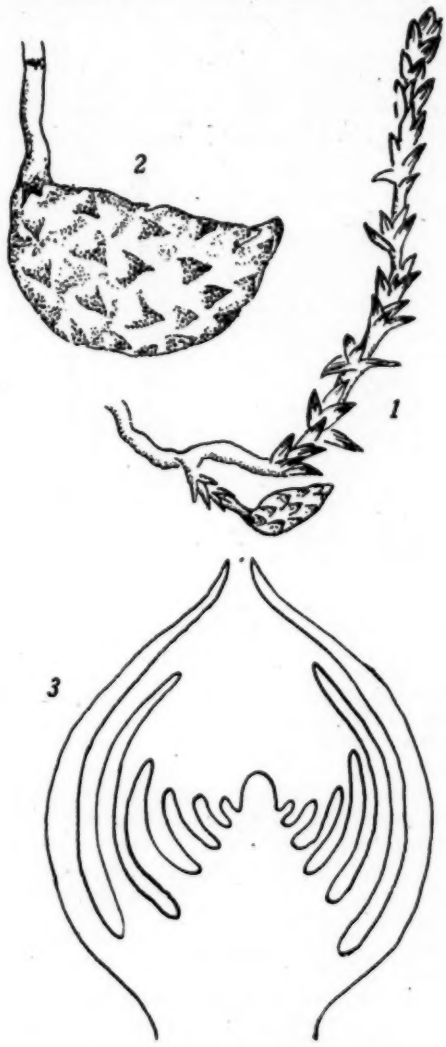



FIG. 1. Showing turion × Natural size.
FIG. 2. Enlarged view × 4.
FIG. 3. Longitudinal section showing the apical shoot × 6.

Fully developed turions are tuberous, cinnamon-brown and covered with scale leaves. In transverse sections they show the growing point in the centre and several enveloping layers of scale leaves which are studded with food material, and give a blue colouration with IKI.

Turions collected during April and May were hard and ovate to spherical in shape. Those collected in July, following the commencement of rainy season, showed early stages of germination and consequent regeneration of new shoots. Longitudinal sections of turions at this stage showed the rapidly developing apical shoot (Fig. 3) with its nodes and internodes.

It appears that adverse weather conditions such as low temperature, lack of water resulting in a severe competition for food and space among the plants induce turion formation. In the present case drought and consequent drying up of ponds are probably the chief causes for turion formation.

Grateful thanks are due to Dr. P. Maheshwari, Dr. L. N. Rao and Dr. M. J. Thirumalachar for the help in preparing this note.

Bangalore, K. M. SAFEEULLA.
*October* 10, 1949. H. C. GOVINDU.

---

Arber Agnes, "Water Plants" (1920).

---

## ON THE NECTARY IN THE STAMENS OF *MEMECYLON HEYNEANUM* BENTH.

*Memecylon Heyneanum* belongs to the family Melastomaceæ which is characterised by the presence of peculiar appendages on the connectives of anthers. Ziegler[1] has described the structure and biological interest of these appendages in several species. In the present form there are eight incurved stamens whose connectives are prolonged at the back to form very characteristic horn-shaped appendages, bluish in colour (Fig. 2). Each appendage bears a nectary facing the style in the bud (Figs. 1-2).

The nectary is broad and funnel-shaped (Fig. 4) and its outermost layer consists of narrow elongated palisade-shaped cells with conspicuous nuclei and dense cytoplasm. The vacuoles are present at the basal end only. This is the secretory layer

of the nectary followed by two to three layers of compactly arranged parenchymatous cells.

The single vascular trace entering the filament finally reaches the connective of the anther. Here it gives out a branch passing further up into the horn-shaped appendage and ending blindly at its apex

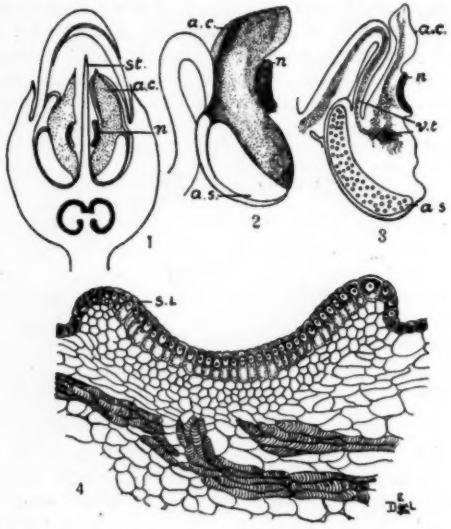



FIG. 1. L. S. of a young flower bud (semidiagrammatic). FIG. 2. A stamen enlarged showing the connective, appendage and nectary. × 23. FIG. 3. L. S. of same showing vascular supply. × 23. FIG. 4. L. S. nectary (*a.c.*, appendage of the connective; *a.s*, anther sac; *n*, nectary; *s.l.*, secretory layer; *st.*, style; *v.t.*, vascular trace.) × 175.

(Fig. 3). In the appendage of the connective the vascular trace spreads itself broadly and sends some branches to the base of the nectary.

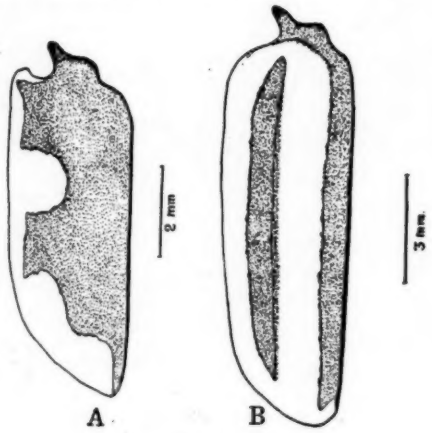
I thank Prof. P. Maheshwari for suggestions, the National Institute of Sciences of India, for the award of a junior fellowship, and the authorities of the University of Delhi for laboratory facilities.

Dept. of Botany, K. SUBRAMANYAM.
University of Delhi,
*November* 2, 1949.

1. Ziegler, A., "Beiträge zur Kenntnis des Andrœceums und der Samenentwicklung einiger Melastomaceen," *Bot. Arch. Mez.*, 1925, **17**, 212-312.

## CICINDELIDS FROM KRUSADAI ISLAND AND KUTIKAL POINT IN THE GULF OF MANNAR

THE commonest diurnal insects on the sandy shores of the Krusadai island are the cicindelids (*Cicindela biramosa* F.). Another larger species, *C. quadrilineata* var. *renei* Horn, characterised by longitudinal stripes on the elytra (*vide* figures) is to be met with while walking from Pamban to




The right elyton of
(A) *C. biramosa* (B) C. *quadrilineata*

Kutikal Point along the southern coast of the Rameswaram island. A detailed account of these beetles will be published later.

Thanks are due to Dr. N. C. Chatterjee, Forest Entomologist, Dehra Dun, for identifying the species.

Sanatana Dharma College, J. SAMUEL RAJ.
Alleppey, S. India, K. V. VERGHESE.
*October* 26, 1949.

## A POSSIBLE EXPLANATION OF THE JOSHI EFFECT

PROF. JOSHI'S postulate of the surface layer origin of the Joshi Effect $\Delta i$ appears probable.[1, 2, 3, 23, 24, 25, 4] Its various determinants follow from the photo-voltaic behaviour of a singlet-formed[16, 17] wall complex $W^{+1/2}$. $(XY)^{-1/2}$. It is assumed that (i) this complex is stabilised owing to the electron donating property of a semiconductor, *e.g.*, glass (ii) under the

operating fields ($< V_m$, the threshold potential) the complex ionises into $(W.XY)^+ + e(-)$ and the latter contributes to the discharge current $i$; and finally (iii) light dissociates the complex into either, or/and (*a*) $W + XY$, (*b*) $W^+ + XY^-$, (*c*) $WX + Y$, (*d*) $(WX)^+ + Y^-$. The light action introduces, therefore, negative ions *in lieu* of electrons as in (ii) or/and neutral particles, causing $\Delta i$. Enhanced temperature instabilises the complex and therefore reduces $\Delta i$, as reported.[2, 5] The favourable effect on $\Delta i$ of a rise in gas pressure[12] follows from the corresponding increase in the complex concentration; similarly, ageing [1, 2, 13, 14, 24, 25] under the discharge favours it. An increase of light frequency [1,3,6,7] and intensity [29, 3, 8, 13, 15] should aid (iii) and therefore, $\Delta i$. The boundary complex being the photosensitive material, primary to $\Delta i$, its non-dependance on selective absorption of the excited gas is to be anticipated[1, 26]; as also the profound influence of the wall material[1, 5, 27] and the comparatively greater $\Delta i$ in transverse than in longitudinal irradiation.[21, 22]

The complex formation should develop with gases possessing resonating semipolar single bond structure[18,19]; or with a tendency, under excitation, to pass into that structure whether single or multibonded, *e.g.* $W^{+1/2}\cdot O__ (O)^{-1/2}$ or $W^{+1/2}\cdot H_(OH)^{-1/2}$ in order to accept the electron donated by the wall molecule W. The observed order in respect of $\Delta i$ in various elementary gases follows, *viz.*, $Cl_2 > Br_2 > I_2 > O_2 > N_2 > H_2 > Ne$. Due to polarisation from complex formation, surface layer ionises[28] at a lower voltage $V_m$. At higher voltages unpolarised molecules even in the bulk start ionising when surface ionisation becomes unimportant. This explains the appearance of maximum $\Delta i$ near $V_m$ implied in (ii) and its decrease thereafter. [2,5,7,10,11] Since large potentials are required for conduction at large gas pressures the inhibitive influence of the latter follows.[12]

A typical result in this field that $\Delta i$ is linked preferentially with the H.F.s[9,10,11] may now be considered. The ozoniser is essentially a compound condenser[2] discharging once every period through an internal resistance, characteristic of the excited gas, which is inverse of the associated conductivity. The observed decrease of the latter (as in $\Delta i$) should reduce the H.F.s since the resistive damping increases rapidly with the frequency.[1,10]

Joshi has generalised that a $+\Delta i$ occurs at low applied potentials[2] and ascribed it *inter alia* to a simple photoelectric effect at the boundary layer uninterfered with by secondary changes. On the basis of the theory now advanced, at low applied V, the process (ii) is negligible. Irradiation leading to (iii) should release negative ions and therefore, enhance the conductivity constituting the positive Joshi Effect.[1, 2, 11]

Our grateful thanks are due to Prof. S. S. Joshi, D.Sc. (London), F.R.I.C., F.N.I., for his valuable suggestions and kind help.

SAIYID SHAMIM-AHMAD.

Chemistry Dept.
Muslim University Aligarh,

M. V. RAMANAMURTI.

Hindu University, Banares.
*August* 22, 1949.

---

1. Joshi, *Pres. Addr. Ind. Sci. Cong. Chem. Sec.*, 1943. 2. —, *Curr. Sci.*, 1947, **16**. 19. 3. —*ibid.*, 1945, **14**, 35. 4. —, *ibid.*, 1945, **14**, 175. 5. —, *ibid.*, *ibid.*, 1946, **15**, 281. 6 —, *ibid.*, 1944, **13**, 278. 7. — 1945, **14**, 317. 8. —and Deo *ibid.*, 1943, **12**, 306. 9 —, *ibid.*, 1945, **14**, 67. 10. —, *Proc. Ind. Acad. Sci.*, 1945, **22A**, 389. 11. —, *ibid.*, 1945, **22A**, 225. 12. — and Deo, *Nature*, 1944, **153**, 434. 13. ——, *ibid.*, 1943, **151**, 561. 14. Deo, *Proc. Ind. Acad. Sci.*, 1945, **21**, 76. 15. —, *Ind. J. Phys.*, 1944, **18**, 83. 16. Ingold, *J. Chem. Soc.*, 1926, 1315. 17. Sugden, "Parachor and Valency," Routledge *ed.* 1930, p. 131. 18. S. Shamin-Ahmad, *Proc. Ind. Sci. Cong. Chem. Sec.*, 1948, A. No. **19**. 19. —, *ibid.*, 1949, A., No. **64**. 20. Deshmukh, *J. Ind. Chem. Soc.*, 1947, **24**, 211. 21. Prasad, *Proc. Ind. Sci. Cong.*, 1947, *Phys. Sec.*, A, No. **17**. 22. Tawde and Gopalkrishnan, *Proc. Ind. Acad. Sci.*, 1949, **29**, 171. 23. Venkateshwar Rao, *ibid.*, 1948, **27**, 72. 24. Ramanamurti, *J. Ind. Chem Soc.*, 1943, **25**, 235. 25. Goel, *ibid.*, 1947, **21**, 203. 26. Venkateshwar Rao, *Proc. Ind. Acad. Sci.*, 1943, **23**, 211. 27. Cherian, *Proc. Ind. Sci. Cong., Phys. Sec.*, 1945, A, No. **17**, 28. Birr, E. J., *Z. physik. chemie.*, 1933, **A 165**, 311. 29. Deo, P. G., *Phil. Mag.*, 1948, **39**, 978.

## ARTIFICIAL INFECTION OF SORGHUM WITH LONG SMUT

LONG smut of sorghum caused by *Tolyposporium ehrenbergii* (Kuhn.) Pat. has been recorded in South India (Barber, 1909), the Punjab and Bombay. The sori are reported to be few in each ear and an inch or more in length.

The mode of infection of this smut is so far unknown. Several inoculation experiments carried out at the Indian Agricultural Research Institute, New Delhi, have failed to reproduce the disease (Scientific Reports, 1947). Mundkur (1945) surmises that infection may be through the flower.

In May 1949, a severe outbreak of this smut was noticed in several places. Many sori were noticed in each ear and a high percentage of the plants was affected. Viable spore material from this crop was utilised for inoculation at Coimbatore. The spores readily germinated producing many sporidia. Preliminary inoculation experiments were carried out in August in the field on a crop of Co 11 strain of sorghum, by (1) spraying a suspension of germinating spores on the ears, just emerging from the boot leaf, (2) brushing the spikelets of similar ears with the germinating spores, and (3) pouring a suspension of germinating spores inside the sheath of the boot leaf before the ears emerged. Controls were kept in all cases.

Fifteen days after inoculation, sori were observed only among plants inoculated by the third method. The experiments were repeated in an isolated plot in the pot culture house on a crop raised from disinfected seeds. Method (3) was adopted. Two days later, the ears emerged from the boot leaf. Successful infection was obtained again, the period of incubation being 12 to 15 days. The cultures of sorghum that were inoculated were Co 11, A. S. 7589 and 7571 and all of them were affected. This successful artificial inoculation of sorghum by the smut proves that infection is through the young flower before the ear emerges from the boot leaf. In the second series, the ears were enclosed inside paper bags for four days after inoculation. The number of flowers infected per ear varied from one to seven. This is in keeping with the intensity of infection observed in Coimbatore.

Mycology section, Agric. Res. Institute, Lawley Road, Coimbatore,
*September* 19, 1949.

T. S. RAMAKRISHNAN.
G. S. REDDY.

1. Barber, C. A., *Madras Dept. Agric. Bull.*, 1909, **49**, 276. 2. Mundkur, B. B., *Ind. J. Agric. Sci.*, 1945, **15**, 109. 3. *Sci. Rep. Ind. Agric. Res. Inst.*, 1947, 110.

## ULTRA-VIOLET ABSORPTION SPECTRUM OF IODOBENZENE

ABOUT 100 red-degraded bands have been photographed in the absorption spectrum of iodobenzene in the region $\lambda 2850$ to $\lambda 2400$. As in other monosubstituted benzene spectra[1], this band system corresponds to the allowed electronic transition $A_1 \rightarrow B_1$ with the electronic moment lying in the plane of the ring and perpendicular to the axis of substitution. The (0,0) band is located at $\nu 36352$. Towards the red end, the bands correspond to Raman frequencies[2] 230, 340, 780, 900, 1010, 1100 and 1300. A strong band at 61 units from (0,0) is interpreted as giving a difference frequency of the $1 \rightarrow 1$ type of transition, analogous to 67 and 60 in monofluoro and monochlorobenzenes[1]. A similar difference frequency of 90 $cm^{-1}$ is also detected. Progressions of totally symmetric vibrations are observed on the violet side leading to upper state frequencies, 950 and 780.

A detailed discussion of the analysis will be published elsewhere.

Andhra University,
Waltair,
*November* 8, 1949.

K. SREERAMAMURTY.
K. R. RAO.

1. Sponer and Teller, *Rev. Mod. Phys.*, 1941, **13**, 76; Sponer and Wollman, *J. Chem. Phys.*, 1941, **9**, 816; Wollman, *Ibid.*, 1948, **14**, 123, *etc.* 2. Teets and Andrews, *J. Chem. Phys.*, 1935, **3**, 175.

# REVIEWS

**Modern Text Book of Intermediate Physics.** (Volume One). By A. N. Banerjee. (Das Gupta & Co., Ltd., Calcutta), 1949. Pp. xiv+ 224. Price Rs. 6/.

In the preface to the book the author mentions that he has taken pains to state the physical principles in simple language and to show their significance by applying them at once to phenomena with which young readers are quite familiar. In achieving these objects the author has succeeded to a remarkable extent. The treatment of the subject-matter in this first volume is under three heads — General Physics, Sound and Heat. Throughout the book the author has consistently tried to propound the basic principles of classical physics so as to be easily assimilated by the Intermediate student. The first impression of the book is that it is a well-planned text book with plenty of diagrams. A noticeable feature is the illustration of physical principles by a large number of phenomena drawn from every-day life. The treatment of Sound and Heat is fairly satisfactory. Puluj's frictional method of determining mechanical equivalent of heat could have been included. Under radiation correction, methods other than Rumford's compensation method could have been described. Nevertheless the subject-matter of Sound and Heat will meet the requirements of Intermediate students. But the handling of dynamics and statics under General Physics does not come up to the standard required by Mysore and Madras Universities. Topics like centre of gravity, simple machines, requisites of a good balance and equilibrium under concurrent and non-concurrent forces have not received the attention they require. This trouble arises no doubt from the vagaries of the Physics syllabus in different Universities, which handicap the text-book writers all over India by restricting the usefulness of their labour. It would not impair the serviceableness of a book if certain chapters, such as Properties of Matter and Simple Harmonic Motion in the present instance, have to be eschewed by a class of students; but a text-book will fail in its duty to a certain section of students if all the required portions are not included.

Exercises have been set at the end of each chapter: it is regrettable that a uniform procedure has not been followed in giving the answers to the numerical problems. While dealing with rotational motion on page 47, it would have been more precise to mention that *uniform* rotation is meant, especially as this paragraph succeeds accelerated linear motion. Such drawbacks and errors of spelling noticeable here and there have arisen perhaps on account of the hurry in rushing through the publication simultaneously in three different printing presses. Looking at the paucity of Indian text-books on Physics, the present volume is a commendable attempt and I dare say that in the next edition it will be improved and enlarged so as to be useful to a greater circle of Intermediate students.

L. S.

**Terrestrial Radio Waves.** By H. Bremmer. (Published by Elsevier Publishing Company, Amsterdam, London & New York. London Office: Clever-Hume Press Ltd., 42-A South Audley Street, W. I), 1949. Pp. x + 344. 91 Illustrations. Price $ 6·75.

This book is a most welcome addition to the rather scanty literature available on the subject. It provides an excellent treatment of the mathematical—physical methods for the computation of transmitter fields. It is divided into two parts. Part I deals with the theory for a homogeneous atmosphere and Part II deals with the theory of inhomogeneous atmosphere. Thus, both the ground wave and sky wave propagation come up for adequate treatment. The most essential features of the recent literature on the subject have been successfully incorporated in the text. This adds considerably to the value of the book. Both the prospective investigator and the advanced student have in this book a collected and comprehensive account of the present position of the subject. As such, the book is indispensable to both.

Formulæ which are very essential for numerical calculations of the ground wave field have been collected together. They can thus be used without going into the detailed mathematical derivations. Typical graphs have been well drawn and reproduced for the field of a 1 Kw transmitter. These features extend the utility of the book to the practical engineer.

The printing and get-up of the book are excellent. In brief, the book is worth its weight in gold and the author deserves all praise in producing a work of this type. It can be recommended as a valuable addition to the Mathematics, Physics and Communication Engineering Libraries.

S. V. Chandrashekhar Aiya.

**Table of Sines and Cosines to Fifteen Decimal Places at Hundredths of a Degree.** By U. S. Department of Commerce, National Bureau of Standards, Applied Mathematics Series 5. (United States Government Printing Office, Washington), 1949. Price 40 cents.

The Applied Mathematics Series of which the volume under reference forms the fifth publication is intended to serve as a vehicle for the publication of mathematical tables, manuals and studies by the Mathematical Laboratories of the National Bureau of Standards. Trigonometric tables with decimal subdivision of the degree are of great convenience in numerous problems of applied mathematics. To meet the need for such tables, the present volume provides a tabulation of the sine and cosine to 15 decimal places at intervals of one-hundredth of a degree. The arrangement adopted here, of columns of sines and cosines side by side and also of the second central differences alongside, will be found convenient in many cases where both sine and cosine functions are desired for the same argument, or where Taylor's theorem is to be used for interpolation.

R. S. K.

**An Elementary Text-Book of Organic Chemistry.** By D. D. Karve (Dartane Bros, Poona 2), 1949. Pp. viii+192. Price Rs. 2-12-0.

This short course in organic chemistry designed for the I.Sc. and I.Ag. standards of the Bombay and Poona Universities is well-planned, the fundamentals being presented in a simple, easy and straightforward manner.

The opening chapter indicates the scope of organic chemistry as a distinct branch of study. This is followed by a chapter on the purification of carbon compounds. It would nave been better if the methods of fractional and steam distillation had also been mentioned. The logical order should have been maintained as regards the 'qualitative' detection of the elements and their 'quantitative' estimation before the determination of molecular weight and assignment of molecular formula. The tests for halogens might have included confirmatory tests as well. Tests for their detection in the presence or absence of nitrogen could have been given. The fact that it is possible to read up to ·001 of a degree with a Beckmann thermometer by means of a lens has been left out.

The treatment of carbon compounds is uniformly good. Wherever necessary, equations and neat line diagrams have been given. At the end of the book, a summary of the preparation and properties of important compounds dealt with have been given in tabular form. Also, a list of questions covering the whole portion, as well as numerical problems of varied types, are appended for purposes of revision. But the book needs considerable enlargement if it is also to cater to the pass subsidiary standards of South Indian Universities. The book is not without lapses and omissions and corrections, which will no doubt be attended to in the next edition.

M. V. S.

**A Community at the Crossroads.** By Sapur F. Desai (New Book Co., Ltd., Bombay), 1948. Pp. 201. Price Rs. 10.

Notwithstanding its small size, the Parsi community has often led the rest in business, finance and philanthropy; while, sociologically, it is a close-knit endogamous community, jealously guarding its non-prosetelysing faith. Its amazing adaptability, as is to be seen from its language, customs, manners, etc., according to the many, is at once a source of its strength and weakness.

Mr. Sapur Desai's monograph of the above title is prefaced by a foreward by Sir H. P. Mody and an introduction by Prof. Jehangir J. Asana and reveals four principal features. The first one, which is by far the most valuable and treated at length, is a factual study of demography based on vital statistics on housing and health, and brings out forcefully the dysgemic tendencies of the community. In the next many recommendations are made for social orientation and the abolition of poverty. The short ethnographic survey which follows extends to the very earliest times, and leads to the conclusion that on their entry into India, the Parsis 'ringfaced' themselves with social, sectarian and racial barriers, and that while the effect of the first two is breaking down, the racial barrier is still a rigid force in the community.

On this score, we are asked to believe that there is something in it which is worth preserving. On page 165 we read: "It therefore behoves the community to keep out of intermarriage"; also, it should be left severely alone "in the interests of the world at large and India herself in particular". Is it a happy reflection that at a time when even the Anglo-Indian community is led to identify itself with the rest of the Indian communities, students of demography can still preach sectarianism in the name of science?

M. C. M.

# SCIENCE NOTES AND NEWS

## Radioactive Isotopes for Hospitals and Medical Centres

A miniature atomic pile has been designed in Britain for use in hospitals, medical centres and health research units.

The apparatus, known as Aspatron, produces radio-active isotopes. These isotopes remain active for periods ranging from eight hours to three weeks.

The equipment is portable and weighs barely two cwts. It produces isotopes by using uranium in the form of a pure oxide. This is arranged inside the apparatus in a specially designed pattern within a double wall of metal packed with the material which increases the efficiency of atomic reaction. There is no danger from radiation since its range is limited and nullified by adequate safeguards. The cost of each equipment is estimated at about £ 500 (Rs. 6,667).

## Wave Propelled Boats

A method of driving a ship by wave motion, without the aid of sail or engine, has been devised by Mr. Sydney McCubbin, of Victoria, Australia.

His two model ships have each attached to them twin diverging metal arms fore and aft. The arms extend below the surface of the water. Across the ends of each pair a horizantal oblong paddle is attached by hinges.

In operation the arms change their position in the water when the ship's hull follows the contours of the swell. The movement of the arms agitates the paddles, and drives the vessel forward. The propulsion is thus based upon the principle of wave motion.

The inventor states that the device requires a reasonable wave form with a comparable amount of wind to function successfully. It was intended primarily as auxiliary power, and probably would be best suited to fishing craft and lifeboats. The arms and paddles could be so constructed, as to be folded inboard when not in use.

## British-Designed Boilers

A factory at Agarpara, near Calcutta, will soon be manufacturing shell type boilers of British design for the ever-growing Indian market.

The boilers to be made there will be to designs supplied by Babcock and Wilcox and will be manufactured under licence from that firm. They are of a type used in many factories where a simple design is required and where there is a demand for "processed" steam (used for heating, drying and other purposes) in large quantities.

The agreement provides for a certain number of Indian engineers to receive instruction and practical training at the Babcock and Wilcox works at Oldbury, near Birmingham.

## Zoological Society of India—Foundation Fellows elected in 1949

Dewan Anand Kumar (Solan), Dr. A. A. Ayer (Madras), Dr. K. N. Bahl (Lucknow), Dr. D. V. Bal (Bombay), Dr. J. L. Bhaduri (Calcutta), Dr. D. R. Bhattacharya (Allahabad), Dr. B. S. Bhimachar (Calicut), Dr. B. S. Chauhan (Calcutta), Dr. B. N. Chopra (New Delhi), Dr. B. K. Das (Hydrabad), Mr. M. N. Datta (Calcutta), Prof. R. Gopala Aiyer (Waltair), Dr. S. L. Hora (Calcutta), Dr. M. O. T. Iyengar (Calcutta), Dr. T. J. Job (Barrackpore), Dr. G. L. Kestiven (Singapur), Dr. K. B. Lal (Kanpur), Dr. M. S. Mani (Agra), Prof. H. R. Mehra (Allahabad), Prof. M. B. Mirza (Aligarh), Prof A. B. Misra (Benares), Dr. K. S. Misra (Calcutta), Prof. M.A, Moghe (Nagpur), Dr. K. B. Nair (Trivandrum), Dr. N. K. Panikkar (Mandapam), Dr. H. S. Pruthi (New Delhi), Dr. L. S. Ramaswami (Bangalore), Dr. H. S. Rao (Mandapam), Dr. H. N. Ray (Mukhteswar), Major Dr. M. L. Roonwal (Dehra Dun), Prof. B. R. Seshachar (Bangalore), Prof. R. V. Seshaiya (Annamalainagar), Dr. S. B. Setna (Bombay), Lt.-Col. R. B. Seymour Sewell (Cambridge), Dr. Miss N. G. Sproston (Shanghai), Dr. B. Sundara Raj (Lucknow), Dr. Viswanath (Hoshiarpur), Dr. G. S. Thapar (Lucknow), Dr. A. Wolsky (Delhi).

## Facilities for Advanced Studies in U.S.A.

In pursuance of the Education Ministry's scheme to bring out pamphlets giving detailed information about facilities for advanced studies abroad, another pamphlet called "General Information about the U.S.A." has

just been published. The pamphlet gives information about different types of higher educational institutions in U.S.A. as well as other useful information to students desirous of proceeding to the U.S.A. for advanced studies. It also gives an idea of the necessary preliminaries required of a student before proceeding on the journey.

It is a priced publication and is available from the Manager of Publications, Civil Lines, Delhi.

## D.Sc. Degree Award in Spectroscopy

On the recommendation of the Board of Examiners consisting of (1) Dr. Earl K. Plyler, (Chairman) Physicist, Incharge of Infra-red Measurement, U.S. Department of Commerce, National Bureau of Standards, Washington, (2) Dr. Janes H. Hibben, Chief Chemical Division, United States Tariff Commission, Washington D. C., (3) Prof. David M. Dennison, The Harrison M. Randall Laboratory of Physics, University of Michigan, Annarbor, the thesis entitled "Spectroscopic Behaviour of Diamond and Other Crystals" by Mr. K. G. Ramanathan, M.Sc., has been declared as qualified for the degree of Doctor of Science (D.Sc.) of the Andhra University.

It may be recalled that Mr. K. G. Ramanathan was recently awarded the 1851 Exhibition Scholarship.

## D.Sc. Awards in Chemistry

On the recommendation of the Examiners, Board consisting of Sir J. L. Simonsen, Kt., F.R.S., Prof. H. J. Emeleus, F.R.S., Prof. Garner, F.R.S. and C. K. Ingold, F.R.S., Messrs. G. S. Deshmukh, M.Sc. and D. Singh, M.Sc., have been awarded D.Sc., in Chemistry for the work on 'Studies of the Joshi Effect' in Gases and in Electrolytes, respectively, by the Benares Hindu University.

## ISO Committees on Shellac and Mica

The Technical Committees of the International Standards Organisation for Shellac and Mica will meet in Delhi for the first time in India between January 16 and 19, 1950.

Australia, Belgium, France, Netherlands, New Zealand, Poland, the U. K. and the U. S. A. have been invited for the meeting of the Committee on Shellac. Brazil, Czechoslovakia, France, Hungary, the U. K. and the U. S. A. are the invitees for the meeting of the Committee on Mica. The Sectional Committees of the ISI on Shellac and Mica will constitute the Indian Delegations at these meetings.

Proposals on specifications for seedlac, shellac, dry bleached shellac, classifications of and methods for grading processed mica will be discussed at these meetings with a view to the formulation of international recommendations.

## Biochemical Congress

The first International Congress of Biochemistry was held at Cambridge recently.

It was initiated by the Biochemical Society with the support of the International Union of Chemistry. Prof. A. C. Chibnall presided over the session and Prof. E. C. Dodds acted as the Chairman of the Executive Committee.

Sections covered include animal nutrition and general metabolism; structure and synthesis of biologically important substances; cytochemistry; biological pigments; oxygen carriers and oxidising catalysts; hormones and steroids, chemotherapy and immunochemistry; plant biochemistry and industrial fermentations.

## IXth International Congress of Entomology

The IXth International Congress of Entomology will be held on August 17th-24th, 1951, in Amsterdam (Netherlands). Entomologists wishing to receive in due course programmes and application forms are requested to communicate already now with the Secretariate c./o. Physiologisch Laboratorium, 136 Rapenburger straat, Amsterdam.

Further communications will follow in 1950.

## INTERNATIONAL CONFERENCES

| Date | Subject of Conference | Convening Body &/or Organisers | Location |
|---|---|---|---|
| Dec 26–31 .. | 116th Annual Meeting of the American Association for the Advancement of Science | American Association for the Advancement of Science | New York |
| Dec. .. | 1st Congress of the American Union of Occupational Medicine | Gen. Secretary, Avenales 981, T.W. 42, Callao 1015, Buenos Aires | Buenos Aires |
| Feb. 28, 1950 .. | Conference on Pneumosilicosis | Dean, School of Public Health and Tropical Medicine Universlty of Sydney | Sydney, Australia |
| Mar. 20–23 .. | Convention of Electric Railway Traction | Institution of Electrical Engineers, Savoy Place, W.C. 2 | London |

Editor: M. Sreenivasaya, B.A., F.I.I.Sc., F.A.Sc.
1353-49 Printed at The Bangalore Press Bangalore City, by G. Srinivasa Rao, Superintendent and Published by Dr. M. A. Govinda Rau, M.A., Ph.D., for the Current Science Association, Bangalore.